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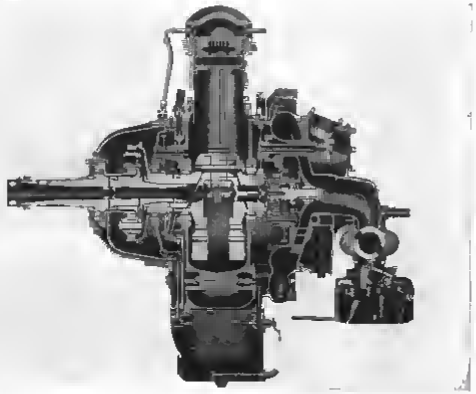

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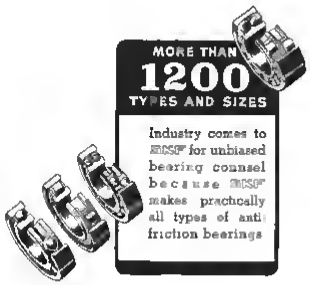

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BALL AND ROLLER BEARINGS

The Birdmen's Perch

Our New Year's resolutions for The Perch are: (1) bigger whoppers, (2) funnier gossip, (3) crazier squibs. This is a first class platform, especially since it's up to you fellows to deliver the news. Why don't you sit down right now and send us a few tales out of school? Address the scandal to

MAJOR AL WILLIAMS *Manager, Aviation Department,*
Gulf Aviation Products, Gulf Building, Pittsburgh, Pa.

A LETTER FROM AUSTRALIA

"I would like very much to correspond with American aviation enthusiasts. If you could mention this fact in your page, I should be very pleased.

I would like correspondence with either sex, so long as the persons are not more than twenty years of age.

"My name is Douglas Chambers. The address, Burbanks, Via Coolgardie, West Australia.

"I sincerely hope this will not be too much trouble to you. I think you ought to start up a pen friends club. Don't you think so, too?"

WE POINT WITH GULFPRIDE

We learn that Eastern Air Lines has recently completed its 32-millionth passenger mile using *Gulfpride Oil*. Two bouquets for this swell record! one to Eastern, the other to Gulfpride!

CHARLIE'S BEEN FOUND

Sometime ago in your column you wondered as to the whereabouts of Charles Augustus Macatee 3rd, who used to fly in these parts.

Well, this bird has finally settled down as a co-pilot with American Airlines. He is assigned to the New York-Chicago via Washington run, and twice a week comes through and leers at us from the pilot's compartment of a Douglas.

Mr. Macatee has also managed to wangle himself a commission as an Ensign in the Naval Reserve, and last summer spent two weeks at Cape May on active duty, scaring the natives and summer visitors to death.

—JAY SCOTT, Washington, D. C.

PENNSYLVANIA-CENTRAL LANDS 230 POUNDER

R. L. (Bud) Baker has been named Chief Pilot for the recently formed Pennsylvania Central Airlines Corporation.

He has 50 pilots under him, and they love it. Personally, it distresses us to think of *any* pilot being under him, for Bud weighs around 230 pounds.

Incidentally, both Pennsylvania and Central Airlines have long been enthusiastic users of Gulf Aviation Gas—and the new combine plans to continue this sensible procedure.

MATERNITY MAN

An Eskimo woman in an isolated Alaskan village was about to have a baby. The Indian Service nurse wired for a plane to rush the native woman to the Fairbank's hospital. Soon the ship was whirring low over the settlement.

The nurse pointed out the window and said to her patient, "Look, there's the airplane that is going to take you to the hospital."

Maybe she thought it was the stork, but anyway the expectant mother, frightened half to death, had her baby then and there. Special Delivery, so to speak.

—K. B.

THIS MONTH'S WHOPPER

A pilot who combines flying and fishing tells this story.

"Last summer I flew up to a mountain lake, sat down, got on one of the pontoons and began casting. No luck. Meanwhile an old gent in an equally old boat was catching plenty of good fish.

Inquiring what bait he was using, he replied, 'Frawgs.'

So I beached my ship and went looking for frawgs. Chased several small ones with no success. Heard a thrashing in the underbrush, and on investigation discovered a medium-sized moccasin trying to swallow an oversized frog.

Rushed back to the ship to get a weapon to kill the snake. I grabbed my oil can (filled with Gulf Aviation Gas for priming) deciding to gas the reptile. Ran back and knocked the snake silly with a small stick, the frog slipping from its mouth.

"Put a foot on the frog to save him for bait, at the same time giving Mr. Moccasin several squirts of Gulf Aviation Gas down his throat.

Took my frog and returned to my pastime. No luck, but did a beautiful job of drowsing in the warm sun. Was awakened by a gentle tapping on my thigh, and looking down, there was Mr. Moccasin with a very pleased expression on his face and another frog in his mouth.

—"Deepwater Jim" Melton

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AVIATION

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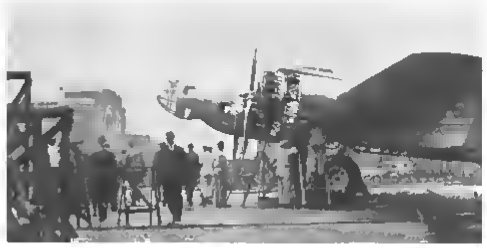

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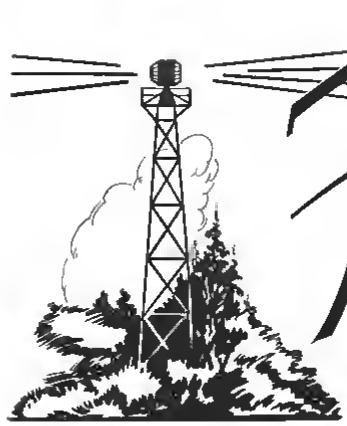

Flashes

From the Skyways of the World

» AMERICAN AVIATION seems to be suffering from the *wanderlust* in a big way, and we think it is a good idea. In our recent wanderings about Europe we met a flock of our friends who were going places and seeing things. Almost the first person we bumped into as the "Queen Mary" pulled away from the dock on the way over was Ted Wright, Curtiss-Wright's genial director of engineering. Presently we found that Jim Taylor and Bert Ainsworth with their charming wives were also aboard. Several days later we stepped into a "lift" (elevator to you) in London's Savile Row, and there was Lester Gardner just in from his Grand Tour. In the 27 days since we had seen him board the Hindenburg at Lakehurst he had visited practically all the aeronautical Brass Hats in Russia, Germany, Italy, and France. And the way England feted him was a great tribute to his popularity abroad. In Holland we met Arthur Nutt, Chief Engineer of Wright Aeronautical. He was there between visits to Russia and Italy to read a paper, originally presented to Germany's Lilienthal Society, before a group of Dutch engineers at Amsterdam's Schiphol. A fellow-passenger on a Lufthansa Ju 52 going up to Berlin was W. J. Austin of Cleveland's well-known Austin Company. A few days later Ted Wright caught up with us in Germany and we joined forces on visits to Heinkel and Junkers. We also had the pleasure of his company to Paris via Amsterdam. The Paris Show

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AVIATION'S AUTHORS

We have with us this month. . . . *Edward P. Warner*, who needs no introduction to readers of this magazine. Ed has reviewed 1936 as seen by the airplane designer, also has carried on with his notes on the recent SAE Production Meeting. . . . *Professor C. Fayette Taylor* of M.I.T. looks over last year's trends in engine design. . . . The Army and the Navy Year are reported on by their respective chiefs, *General Oscar Westover* of the Air Corps, and *Admiral Arthur B. Cook* of the Bureau of Aeronautics. . . . *Col. E. S. Gorrell*, who covers air transport progress, heads up the Air Transport Association of America. . . . *Dan Brimm* is doing an interesting job in "teaching the young idea" in Manhattan High School of Aviation Trades. He has an extensive background of engineering experience, and is an old hand at flying seaplanes. . . . and then your editor has come back from Europe so full of what he saw that he has taken up several pages to talk about the Paris Show and European military aviation.

attracted a number of wandering Americans, among them, Bob Farnsworth and Les Miller of Curtiss-Wright and Ted Koenig, U.S. Air Attaché from Berlin. Reported present also were United's Tom Hamilton and Don Brown. Jack Ide, the N.A.C.A.'s European representative, did a swell job as host and general "fixer-upper" for all of us. Toward the end of our Paris visit Al Williams of the Gulf Company dropped in for a look at the Show after a two month's cruise about Europe. He and Mrs. Williams were among the "Queen Mary's" passengers on Nov. 25.

» AND SPEAKING OF TRAVELLING. We had a letter not long ago from R. B. Jackson of the Aerial Transport Company of Siam in Bangkok, calling our attention to a previous exchange of correspondence that had set a record of sorts for air mail from Bangkok to New York. He had had a reply to an inquiry to AVIATION in just 25 days. Since the distance is about 25,000 miles for the round trip, the letters averaged about 1,000 miles a day. They travelled via KLM to and from London, but by ocean mail between London and New York. If they had caught the Hindenburg instead of the steamers another six days might have been shaved off. Which would have put them in the

(Turn to page 15)

(Continued from page 13)

same class with Wickey The Hat, a battered Stetson that recently travelled some 75,000 miles in 5½ months over practically all the airlines in the world before being returned to its owner, Wickey the Retired Expressman.

» SPERRY COMPANY'S PEOPLE seem to get about a bit, too. In the last three months, according to J. A. Fitz, 28 of their employees put in well over 75,000 miles of air travel. Included were a couple of trips on the Hindenburg, four coast-to-coast flights, and a one-way run to B.A. They consider this total about average.

» PASSENGERS ON TWA need not worry about revising their drinking habits if they think they are "seeing double." The line numbers two sets of identical twins among its employees. Twins Maurice and Merrill Williams each occupy left-hand cockpit seats as First Officers. Twins Marjorie and Margaret Stuecken are Air Hostesses.

» WHILE ON THE SUBJECT of stewardesses, KLM has just started putting uniformed girls on its European and Colonial Douglases. Dutch Hostesses have to meet the same general specification as ours, but in addition have to speak at least four languages. How many of our flying gals could pass that one?

And Eastern Air is just starting with Flight Stewards, patterned somewhat along Imperial Airways' London-to-Paris service. Just as a bit of a warning to the lads that are taking the jobs, Mr. Bewsher, local I.A. representative, told us the other day that they had put a pedometer on a couple of their stewards and discovered that they actually walked all of four miles back and forth inside the ship on the average 2¼ hour journey between the English and French capitals! Perhaps some marathon training would be of some help to prospective cabin attendants.

» AVIATION GATHERINGS in the east will miss the presence of genial George Orr, long time president of Roosevelt Field. George is deserting this flying business to devote himself to the cure of colds as vice-president of Vick Chemical.

» WHEN WE DROPPED IN to see Dan Brimm at work not long ago, we were struck by an unusually fine piece of work that a WPArtist is doing on the walls of the school lobby. It depicts the rise of air transportation, in the modern manner. Well worth a look; any school day at 222 East 64th Street, Manhattan.

Double double. No this is not a set of full scale quadruplets but two pairs of TWA twins.

» SPEAKING OF THE GREAT MASS MIGRATIONS OF HISTORY, Stewart-Warner's Alemite sales force descended on Chicago 120 strong from nine TWA Douglases on Dec. 13. Extra planes and extra schedules were used to bring the salesmen from all parts of the U.S. for a three-day convention. Speed and economy dictated the decision to use the airways. Here's an idea for other outfits that go in for national conventions.

» AND HERE'S THE KIND OF NEWS that is cheering at this time of year. Pan American has announced a dividend—and a general salary increase for its employees all over the system.

» AN INDICATION OF THE GENERAL acceptance of air express turns up in New York newspapers where a leading department store advertises that "there is still plenty of time left to send a [illegible] gift by air express." Full page maps give air express travel time from New York to all principal cities in North and South America.

» WE WELCOME BACK to AVIATION'S staff Charles F. McReynolds who is to represent us on the West Coast beginning with the first of 1937. Charlie was our West Coast Editor up to mid-1932. Since then he has been one of the prime movers in Al Menasco's engine company. From time to time he covered special assignments for us (we may now disclose the fact that he was Secret Agent No. 1313X of the September issue), but we are glad to have him back as a full time member.

» ANOTHER NEWCOMER to AVIATION'S ranks is Russell Putman recently signed on as sales manager. Mr. Putman has had long experience in both the publishing and aviation fields. A war time pilot, he served in France in 1918. He is also a member of the Quiet Birdmen. Mr. Putman takes charge of all AVIATION'S commercial activities.

» ALTHOUGH IT IS TOO LATE to do much about Christmas at this time, the Staff of AVIATION takes this occasion to wish all readers of the magazine a Happy and Prosperous New Year.

Side Slips

By ROBERT OSBORN

» As AVIATION GOES TO PRESS for the first issue of the new year, it saddens one to reflect on the holiday season which once had the happy slogan of "Peace on Earth Good Will toward Men" This Christmas season, in the old countries, the sound of the hooves of Santa's prancing reindeers was unheard over the heavy footsteps of marching men, and the gleam of the candle on the Christmas tree was

snuffed out for the practice air raid emergency The children dropped their candy canes to raise their hands aloft in the approved military salute as they heard the harsh voice of the dictator on the radio drowning out the tinkling bells of the collectors for charity One should not gain the impression however, that all sentiment and regard for one's fellow man have been lost in the rising tide of European militarism—in the busy armament factories of several countries all work was suspended for two minutes of silence on Armistice Day.

On this side of the water it is pleasant to see the hearty response to the "Good Neighbor" policy of President Roosevelt Let us hope that the program will develop into something worth while and that the countries of the western hemisphere will be able to abide in peace throughout the next war, and that they will keep their tempers even if their European neighbors throw a few tin cans and dead cats in the back yard, or one of their little boys happens to trample down the geranium bed

So being thankful that we live in one of the few countries which shows some promise of at least trying to avoid disaster, we greet the new year with best wishes for all friends, if any, and enemies if any and all others, if any

» SPEAKING OF THE HAPPY YULETIDE SEASON, we see by the papers that the United States and Great Britain are disputing ownership of Christmas Island, because of its value as a naval base. The first blizzard of the winter has convinced us that our trapping route on Hudson Bay is going to be a very cold one to follow, but we still think it to be a better place for our dug-out for the next war, than the south sea islands

» THE NEWSPAPERS TELL of another Santa Claus who came to grief in attempting to make his arrival by air The Saint Nick who was hired by a Lansford, Pa, department store to drop in by parachute missed the landing field by three miles because of a high wind and had to be taken to the hospital with a broken leg

This reminds us of a pilot friend of ours who was asked to deliver Santa in his airplane to the parking space next to a Buffalo store. He managed to ship the ship without damage into the small lot but he knew there wasn't a chance of flying it out again There was much whispered discussion and shaking of heads among the very young when the airplane had to be taken apart and hauled away

» WHILE ON ONE OF HIS FREQUENT FLYING TRIPS TO CANADA, Bob Fogg found the following advice to

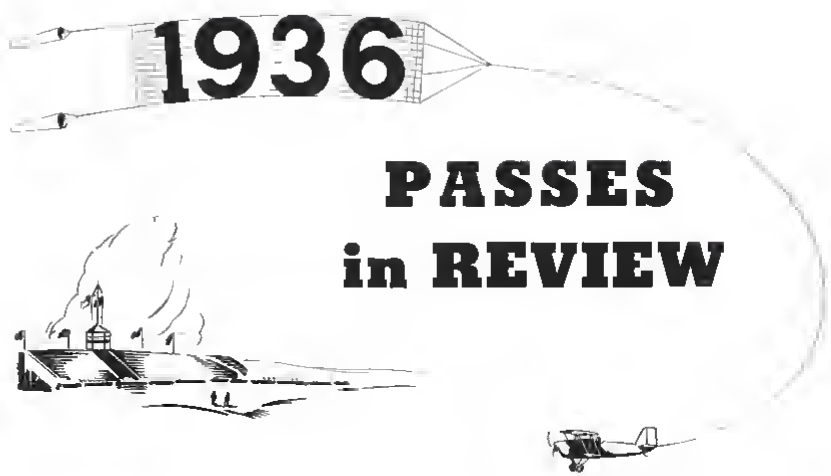
students on the bulletin board of the Canadian Flying Club, and passes it along to American student pilots:

"When flying, try to imagine you are dancing with a little fairy and not trying the best of three falls with Sophie Tucker

When in doubt ask your instructor and not a fellow pupil The latter may cause your parents a great deal of grief"

» MR IGOR SIKORSKY seems to be not only a designer of excellent airplanes but to be possessed of the soul of a poet. We always used to admire his after-dinner speeches in which he sold amphibians to business men by his descriptions of the vast stretches of silvery lakes one sees at sunset Now he is predicting passenger transports which will weigh one million pounds and carry one thousand passengers and "which will be so steady that even water in a glass will not be spilled in rough air"

FRENCH MACHINES formed the backbone of the XVIth Exposition Internationale de l'Aeronautique. Here we see the latest in military and civil offerings. In the foreground the new Amiot bomber. Across the center, the Caudrons. In the background, three of the newest military types, the Hanriot, the Potez 63, and the Marcel Bloch 131. (See also page 26.)



THE TIME HAS COME, as the Walrus once said, to speak of many things. But since we are writing neither for *Food Industries* nor for the tabloid press, we will have to pass up the cabbages and the kings in favor of ships and sealing wax. Ships—because we write about aviation. Sealing wax—because we are now winding up the affairs of 1936.

A year ago we looked back over the record of 1935 with considerable satisfaction as a year in which the aviation industry staged a remarkable recovery from the staggering blows dealt it in 1934. We then looked ahead at 1936 with high hopes and, as the year closes, we see that our hopes have been justified. Although few events of the year stand out as spectacular, the ground gained during 1935 has been consolidated, and substantial advances have been made on all fronts. Aeronautical people all along the line may consequently look ahead into 1937 anticipating further advances at an accelerating rate.

Our commercial aviation leads the world. With intelligent cooperation among airlines, and between operators and manufacturers, we are moving rapidly ahead in the development of safe and efficient aircraft for the transport of passengers and cargoes.

On the military side, as pointed out elsewhere in this issue, we have been far and away outdistanced quantitatively by European nations in their mad race for air supremacy. On a performance basis, however, our equipment is the equal of anything in the world. Our chief concern over the next year or two should be to build up an efficient air force of a size consistent with the adequate defense of the country.

Apart from military and transport activities, there are definite signs of reviving interest in private flying in the United States. Manufacturers of aircraft, accessories and fuel, operators of air services and of training schools, may look forward to better times in 1937. The rise in the curve of prosperity will not be sharp, but it will be steady. Such business should certainly be 30 to 50 per cent ahead of last year's figures.

Instead of reviewing the progress of the past year ourselves as has been our practice recently, we have asked a group of experts in several fields to do the job for us. The following pages tell their story of progress in airplane design, in engine design, in transport and military aviation. The highlights in the events of the year have been recorded in the News department.

AIRPLANE DESIGN in 1936

By Edward P. Warner

THE 1936 AIRPLANE bears no trademark. Rugged individualism and bright innovation have been playing a losing game. External form no longer owes itself to designer inspiration. It is dictated from Langley Field, Farnborough, Chalais-Meudon, Adlershof, and Guidonia. Point by point the aerodynamic laboratories have covered the aerodynamic features of design, and proved that one way is best and the others not so good; and the wise engineer has acted accordingly, until he finds his freedom of action in matters of general appearance almost restricted to the choice of the shape of the tail surfaces. Let him make the most of his freedom while it lasts; for a research is already started which may result in two or three years in imposing upon all the airplanes of that time tail surfaces as nearly standardized in aspect as are the nacelles or the fillets of the present day.

While it is not yet possible to say that all military and transport ships are low-wing (or mid-wing) cantilever monoplanes, tapered to a tip chord a little less than half that at the root, using airfoil sections of the NACA 23000 series, retracting the landing gear into the wings, with an NACA cowl, flaps, and a controllable-pitch propeller, and with the wing skin doubled or so stiffened as to be fully effective in transmitting stress; it is possible to say in most cases that the machines which do not adhere faithfully to that formula would be better airplanes if they did.

There are of course certain special types that call for different formulas. The flying boat must have a high wing; the biplane has the special advantage of compactness of deck stowage on aircraft carriers, and holds its own for private-owner use, but those are the exceptions.

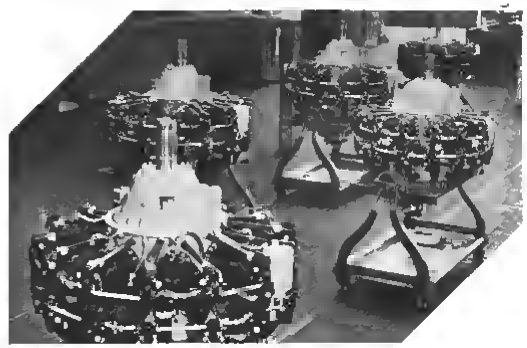
It is then no longer possible to write of 1936, or of any other year, in terms of the striking features of the spectacular airplanes that the year produced. It is necessary rather to focus on the period as the mid-point of a moving average, and to note the strongest undercurrents of the running trends that may be expected to continue and to gain in strength.

What are those trends, now current? They run toward operation at higher altitudes, more homogeneous structures, easier handling on the ground, more critical examination and a more detailed specification of flying qualities, and smoother surfaces.

Going up

To operate efficiently at higher altitudes means more span and higher aspect ratios. There is a tendency

(*Turn to page 67*)



ENGINE DESIGN in 1936

By Prof. C. Fayette Taylor

ALTHOUGH THE YEAR 1936 has not been definitely marked by any startling changes in the field of aircraft power plants, a considerable number of important trends and developments have taken place.

Perhaps the most important trend has been the increasing use of the two-row radial engine. A significant portion of the large airplane engines produced in 1936 have been of this type, which now takes its place beside the single-row radial as an accepted form for both military and commercial use. Another noticeable trend has been the increasing proportion of in-line engines to be found in the smaller airplanes. Very satisfactory forward vision and neat appearance are generally characteristic of such ships.

In addition, development of previous years which have definitely been accepted as service equipment during 1936 are the constant speed propeller, the dynamic vibration absorber, the automatic mixture and boost control and the limited use of 100 octane gasoline by the military services.

The upward trend in take-off power and piston speed which has been evident for some years has continued, both the Wright "Cyclone" and the Pratt & Whitney "Twin Wasp" having definitely been rated up to 1,000 take-off hp., at piston speeds of about 2,500 ft. per minute. This output is truly remarkable for engines of about 1,800 cu. in. piston displacement.

The problem of securing the lowest practicable specific fuel consumption over the cruising range has been definitely recognized during the past year, and much research has been directed toward this end. So successful have these efforts been that the cruising fuel consumption for some of the higher-grade engines is now so low as to approach the claims which have been made for the fuel consumption of aircraft diesel engines under similar circumstances. Contributing factors to the general trend toward lowered fuel consumption have been the introduction of improved automatic and hand operated mixture controls, and in some cases the use of a fuel-air meter. The aircraft-type fuel-air meter developed by the Cambridge Instrument Company, and used in a number of service installations, operates on the

principle of measuring the heat conductivity of the exhaust gases. It is extremely useful in indicating to the pilot when the fuel-air ratio is properly set for a given condition of flight. It serves also as an important safeguard against operating with a dangerously lean mixture with consequent overheating of the engine.

Improvement in cooling and cowling of radial engines has continued. The advent of the Wright "Cyclone" type G in production, with 2,800 sq. in. of cooling fin area on a cylinder of about 200 cu. in. displacement is truly a triumph in pattern-making, foundry and machinery practice. This large cooling fin area has been the most important factor in making it possible to take 1,000 hp. from this engine during take-off. Another factor contributing to the good cooling of this engine is the use of the "long-reach" finned spark plugs developed by the B. G. Corporation. The increase in length of the threaded portion of these plugs has given enough heat-transfer surface so that they run at a temperature only slightly above that of the surrounding parts of the cylinder head.

(*Turn to page 67*)

The ARMY...

By Major General Oscar Westover

THE CONCEPTION of the employment of military aviation has undergone revolutionary changes since the World War. Thus modern conception has been brought about entirely by the enormously increased performance, in all characteristics, of the airplane. It is an entirely different weapon, at least, insofar as bombardment airplanes are concerned, than it was during the last conflict.

During the World War, due to the limited range of aircraft, it was possible, in planning the defense of any of our vital areas, to draw a circle of comparatively small radius with the enemy air bases as a center, and determine within the area circumscribed the possible objectives of any hostile aviation. Due to the comparatively small number of objectives within the range of the aircraft of that time it was possible to take the necessary defensive measures in the way of pursuit aviation and anti-aircraft artillery; and the chances of interception were very great with a possibility of stopping or, at least, seriously interfering with an enemy air raid. With the increased performances of aircraft now attained and those clearly in the offing, the defensive problem has been tremendously increased. During the war we expected to see the enemy planes approaching from the direction of enemy territory, but with present airplanes of long range and high speed with a resultant increased power of maneuver, we can expect them to appear from any direction of the compass. This point alone more than doubles the defensive weapons required, and may cause us to cast aside our present methods of protection against concerted air attacks.

THE INCREASED RANGE makes possible a great many objectives heretofore considered impossible. It also changes our ideas relative to the number of airplanes to be employed, the methods of assigning airdromes for use, the size of the crews, and the capabilities of personnel, such as endurance as compared to the endurance of the equipment. The cruising range of the wartime bombardment airplane was such that no concern was felt for the wear and tear on the crew. However, with the modern bombardment airplanes capable of staying in the air for extended periods of time, far in excess of the capabilities of one crew, it becomes imperative that relief crews be provided. The greatly increased speed of these modern vehicles of defense practically eliminates the necessity for supporting pursuit aircraft, leaving them free for other defensive or offensive missions, particularly, when it is realized that these bombardment airplanes have sufficient defensive guns on board, properly located, to practically eliminate all blind angles of approach for attacking aircraft.

Not only have these modern airplanes changed our ideas as to their employment but many changes have been brought about in their detailed operation. The interior of the airplane is heated so that the crew, without wearing all of the cumbersome clothing which has, in the past, been associated with aviators and cold weather flying, will be comfortable regardless of outside temperatures, be able to move about freely without restriction and thus perform their duties more efficiently.

With the increase in power plants used on these large planes it has been necessary, in order to keep everything functioning properly, to add an engineer to the crew. Likewise, due to the increased range and necessity for proper communications, a navigator and radio operator, in addition to the bomber and pilots, has been provided.

The airplane itself is equipped with an automatic pilot that keeps it on its course and at the proper altitude. Thus the pilot is relieved of many of the manual operations of the past. Commodious accommoda-

(*Turn to page 64*)

The NAVY in 1936

By Rear Admiral Arthur B. Cook

THE SUCCESS with which Naval aviation is carrying out its aim to leave no stone unturned in assuring that our first line of defense shall have available the most efficient and best equipped air arm procurable, is indeed gratifying, not only to those charged with this work but to the people of the United States whose interests the Navy scrupulously guards. But we cannot look with complacency upon the high standards now existing. To do so we know would be fatal to progress. There will be no relaxation in our efforts.

The maximum strength of our Navy was agreed upon approximately fourteen years ago by the Washington Limitation of Armaments Conference, but it was not until the signing of the Vinson-Trammell Bill, in March 1934, that definite authorization for building to that strength was secured. This same act also authorized the procurement of the necessary naval aircraft for vessels and other naval purposes in numbers commensurate with a Navy of full strength under the treaty.

The strategical and tactical employment of aircraft has been tested only during simulated conditions. During the World War aircraft as a weapon was so new that its use was for the most part without definite method and there was no precedent to act as guide. Therefore, little if anything of a constructive nature was learned either first hand or from observation, and certainly nothing in the field of naval aviation tactics. Therefore, we in this country are faced with the necessity of endeavoring to make a practical application of theories under conditions simulating armed conflict. This has called for increasingly extensive and exacting operations. Our operators and designers must work hand in hand, combining vision and practical experience. Operating experience alone can develop satisfactory aircraft and the devices used in handling them for the Navy. Without this close coordination between design and operation U. S. Naval Aviation could not have arrived at the high level it now occupies.

Of primary importance during the past year has been the providing of the best available aircraft to the Fleet. That this has been successfully carried out is evidenced by the highly satisfactory manner in which Fleet aircraft have continued to carry out Fleet requirements.

In the procurement of these aircraft competition has been fostered in the industry to bring out advanced experimental models of aircraft, so that at present, the Bureau has available, for procurement in quantity, one or more models in each class necessary to Naval operations. Replacement aircraft, embodying the latest and most important developments in aeronautics, increased engine powers, improved aerodynamic design contributing to the marked increase in speed range of the types, are the rewards of the unceasing research and development work which has been carried on.

The provision of supporting shore facilities for naval aircraft has not kept pace with the aircraft expansion program now being carried out. While facilities are being provided as rapidly as funds can be obtained, a serious shortage of hangars, of housing and other operating facilities, already exists, and overhaul requirements for aircraft have outgrown available overhaul facilities.

IT IS CLEARLY RECOGNIZED that it is not enough for a nation, in building an adequate air defense, to supply the flying equipment and the personnel in requisite numbers. Com-

(*Turn to page 62*)

AIR TRANSPORT IN 1936

By Col. Edgar S. Gorrell

IN PUBLIC ACCEPTANCE and improvement of services rendered to the public, 1936 has been the air transport industry's best year. Some of the happenings and developments of the year briefly listed will cover the history of 1936:

1 The coordinated development of a four engine transport at lower cost than otherwise possible by five air lines in their signing of the contract with the Douglas Aircraft Company.

2 Coordination of all air lines, large and small, in the issuance and acceptance of universal scrip. This involved a small cooperative advertising campaign approximately eight months prior to the time that the railroads inaugurated theirs.

3 Coordination of the air lines operating in the eastern territory in airway traffic control later taken over by the Bureau of Air Commerce and expanded to other points.

4 Coordination in many items of a routine nature with regard to traffic involving improved service and convenience to the public by all their lines.

5 Continued coordination of technical personnel of the air lines on the subject of maintenance which involved during 1936 the further cooperation of military services and the National Advisory Committee in exchanging experiences and ideas.

6 Coordination of air line industry in its testimony before and assistance to Congressional committees i.e., Copeland and Mead Committees on Aircraft Safety.

7 Coordination of the air line industry for the first time in their cooperation with government approved schools for training of mechanics.

An indication of the increased public acceptance of air transport is found in the traffic gains in 1936. Instead of the usual fall slump passenger traffic reached an all time monthly high in October. The percentage of occupancy during that month was 68 for the domestic lines well above the average for the year and a healthy figure for any form of transportation.

The above items, it is believed, tell the whole story with the exception of the truly marvelous Pacific flights and the new larger equipment placed in service during 1936. They have a direct bearing upon the greater acceptance by the public of air transport in 1936. The formation of the Air Transport Association of America early this year is only incidental. This organization serves as a medium by which any and all coordination such as the above may be handled. It is anticipated and hoped that many more subjects pertinent to the industry and which require coordinated effort will be handled satisfactorily and with dispatch. The Air Transport Association of America is unique among all the hundreds of trade associations in the country in its representation of practically every member of its industry whether large or small. At the close of 1936 all United States' air mail contractors were members. The air lines represented by the Association flew approximately 99 per cent of the passenger miles and flew approximately 99 per cent of the mail and express miles within the United States and 100 per cent of the activity by United States' operators in international service.

WE GO ABROAD And

By S. Paul Johnston

Editor, AVIATION

WHEN THE GOOD SHIP "QUEEN MARY" took off from New York at noon on October 21, your editor was aboard intent upon seeing what he could of European aviation in a short time. Impossible to develop here all the details of the trip. It would take several volumes the size of the present issue to do that. For the moment, we are content to record places visited and things seen.

Space limitation prohibits the listing of the names of the many individuals who contributed liberally of their time and energy to make the trip pleasant and profitable. To them all, again, our sincerest thanks. Mention must be made, however, of a few. For special courtesies and for services rendered our indebtedness is acknowledged to the several plants and organizations listed in the Log that opened their doors for our inspection; to Imperial Airways, to Lufthansa, to KLM, to Air France, for their generosity in the matter of transportation; to the Royal Aero Club, to the Royal Aeronautical Society, to the Society of British Aircraft Constructors, to the British Air Ministry and to the German Air Ministry for courtesies extended; to the members of the American Embassies in London, Berlin and Paris for their helpful cooperation, to the editors of the European aeronautical journals through whom many contacts were established, and last, but not least, to our spiritual grandfather Lester D. Gardner, whose advice and assistance were invaluable.

THE LOG

Oct. 26—Strolled down at Royal Aero Club. Visited McGraw Hill affiliate, Aldwych. Official visit to Air Ministry, Adastral House. Contacted Society of British Aircraft Constructors. Looked in on C. G. Grey at the offices of *The Aeroplane*.

Oct. 28—Visited London office of Imperial Airways. To Croydon for luncheon to inspect aerodrome and Imperial Airways operations and maintenance departments. To Rochester to Short Bros. to inspect Empire boats and Mayo composite aircraft. Motored back to London for tea. Lead dinner in honor of Major Lester Gardner by Royal Aeronautical Society, Royal Aero Club and Society of British Aircraft Constructors.

Oct. 29—To Slag Lane plant of de Havilland Aircraft to inspect motor and propeller departments. To D. H. Hatfield plant to inspect aircraft production and flying school. To House of Lords with Major Gardner to hear debate on "Shadow Scheme" and lor tea with Viscount Swinton and other Air Ministry officials.

Oct. 30—Visited Royal Aeronautical Society Luncheon by Major Gardner for secretaries of R.A.S., R.A.C. and S.B.A.C. By car to Teddington to inspect National Physical Laboratories. Dinner with C. G. Grey.

Oct. 31—Saw Lester Gardner off for the States. Visited offices of S.B.A.C. To Croydon to inspect facilities of Surrey Flying Services and other fixed base operators.

Nov. 1 (Sunday)—Motored to Heston Aerodrome and flew (D. H. Leopard Moth) to Lympne to visit Cinque Ports Flying Club.

Nov. 2—To Cricklewood to see Handley Page plant. Later by car to Radlett Aerodrome, Handley Page test base.

Nov. 3—Visited U. S. Commercial Attache Bush House. By tram to Hayes, Middlesex, to visit plant of Fairey Aviation. Motored to Great Western Aerodrome Fairey test base.

Nov. 4—Final visit to McGraw Hill office. Dropped in on Paulson at editorial offices of *Flight*. By Imperial Airways bus from Victoria to Croydon. Croydon to Amsterdam via Lufthansa (Ju 52). Inspected Schiphol Aerodrome and KLM facilities. By motor to The Hague.

Nov. 5—To Rotterdam and Waalhaven to visit Koolhoven factory and KLM offices. Visited offices of Technische Handelmij Hollandia, N. V. By rail to Amsterdam.

Nov. 6—Inspected KLM maintenance base at Schiphol. Amsterdam to Berlin via Hanover on Lufthansa (Ju 52).

Nov. 7—Inspected Tempelhof Aerodrome. Flew around Berlin in Lufthansa Heinkel He-111. Luncheon by Lufthansa in Haus der Flieger.

Nov. 8 (Sunday)—In Siemensstadt Berlin.

Nov. 9—To Staaken Aerodrome to inspect Lufthansa maintenance base. Luncheon by Reichsverband der Deutschen Luftfahrtindustrie at Reichsverband Kasino. By car to visit Henschel Aircraft factory.

(*Turn to page 68*)

Koolhoven's fighter, the FK 55, single seater, of 28 ft. span with 900 hp Lorraine engine. Not yet flown, but expected to do better than 310 m.p.h.

In circle: Details of the Hanriot (Messier) landing gear. Right: An idea for engine exhibitors. The Walther leverted V-12 in a wire cage to show cowl outline.

deHavilland and in France by Hispano-Suiza) predominated. A large number of the Ratier air- and electrically-operated types were also in evidence. Curtiss-Wright, the only all-American exhibitor, showed for the first time the constant speed electric controllable which they have recently developed.

Although the propeller brake is a relatively new feature in this country, it seems to be commonplace on French aircraft. A number were installed on the ships at the Show.

Engine cowls with controllable trailing edge flaps were the rule for air cooled radials.

Two Dutchmen, Koolhoven and Fokker, furnished the only really radical elements in the Show. The Koolhoven FK55 fighter is unusually clean, and great attention had been paid to secure smooth finish. The 12-cylinder Vee Lorraine engine is mounted well back in the fuselage behind the pilot. It drives two co-axial propellers through an extension shaft which runs forward between the pilot's knees. Object of the two propellers is, of course, torque elimination. By concentrating all weights on the center of gravity high maneuverability is expected. Ailerons were eliminated in favor of a slotted type lateral control device, but details were concealed. Fokker's ship was designed for attack and for light bombing.

The Russian exhibit included a modern looking all-metal transport and a single-engine fighter. Some of the British critics thought that they looked rather dreadful, but they did not look too bad to us.

Among the engines, 14-cylinder radials appeared in numbers. Most striking of this group is the compact Gnome-Rhône M-14 of only 37½ in. diameter, said to develop 650 hp at 3,000 r.p.m. at 13,000 ft. and to give 700 hp for take-off all at a weight of 825 lb. A late arrival that drew much attention was the Bristol-Hercules, 14-cylinder sleeve valve type. No performance data were given but it is probably good for well over 1200 hp continuous rating. Curtiss-Wright showed a cutaway Cyclone and several Whirlwinds.

We See the PARIS SHOW

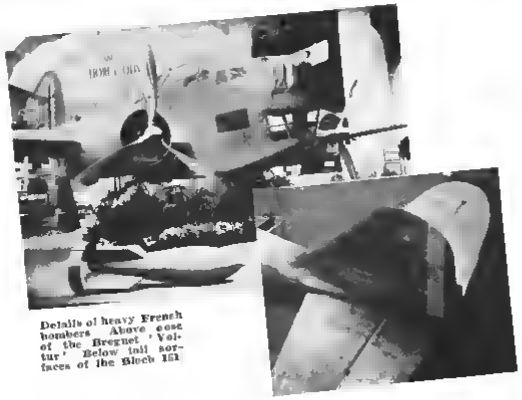
BEFORE WE WENT DOWN TO PARIS we ran across numerous disquieting rumors about the XVth Salon. It was understood that Germany and Italy were definitely not going to exhibit. Russia was doubtful. England was showing signs of withdrawing at the last moment. And besides, we were told, France was teetering on the edge of a political blow-up, and there probably would not be any Show anyway.

Well, there was a Show, and a good one. England and Russia turned up according to schedule. Germany and Italy were absent according to promise. In spite of the absences, however, we thought it was an excellent job, and many a veteran Paris-show-goer pronounced it "the best ever." Herewith, a few Show high spots to indicate the trend of European design thought.

One of the first people we saw was C. G. Gray of "The Aeroplane" stirring busily about with a notebook in each hand mumbling something about "the illegitimate sons of the D.C.-2." Whatever the parentage, the trend toward a common formula was certainly obvious.

Metal construction was definitely in the ascendancy, with monocoque structures in dural sheet the rule rather than the exception. Discussion was heard everywhere over the desirability of flush riveting. Most of the ships exhibited showed this feature in both fuselages and in wings. Great interest was also shown in electric spot welding. This type of fastening in cowling and fairings appeared extensively, and the Hanriot exhibited an interesting combination of spot welding and riveting in the main wing and fuselage structure.

On all types where performance counted, controllable pitch propellers were fitted. The Hamilton-Standard hydraulic type (manufactured under license in England by



Details of heavy French bombers. Above: nose of the Bregnet "Volitur." Below: tail surfaces of the Bloch 131.

Above: The French Loire-Nieuport single-seat fighter. Be circle: only diesel to the show (the 12-cylinder Costoen). Right (top to bottom): The British medium bomber, the Bristol Blenheim, British Rolls-Royce Merlin, nose of British power plants rated at 1065 hp with a weight of 1518 lb. The Fokker G-1 attack reconnaissance or light bomber

AVIATION
January 1937

EUROPE REARMS in the Air

Aeronautical Europe is an eye-opener to visiting Americans, for aircraft production overseas is under way on a scale that far and away exceeds any program contemplated on this side of the Atlantic.

Winged Youth—Icarus stands as the symbol of the New Germany as her squadrons roar overhead

Globe

England swings into production Handley Page watches the christening of the first of the Harrow heavy bombers

By S. Paul Johnston
Editor of AVIATION

WE IN AMERICA have earned a worldwide reputation as mass producers of machinery and mechanical gadgets, but, as far as aircraft are concerned, until we have had a look at production in Europe today, in the words of the poet, "We ain't seen nuthin' yet!" All Europe today is engaged in the building of military aircraft on a scale far beyond anything that has been contemplated on our side of the Atlantic. Charges of reckless spending and rabid militarism have been brought against our present program for air defense which contemplates building up our army and navy air services to a combined strength of about 5,000 machines over a period of five years. The present combined service strength of our air forces is well under 2,000 machines. In contrast, Germany alone at the present time has an air force estimated in the neighborhood of 7,000 machines of all types and a probable production rate of close to 10,000 a year. Considering Europe as a whole it seems reasonable to suspect that aircraft production overseas is to our aircraft production as our automobile production is to Europe's motor car output.

Thus the great armament race that is going on in Europe has taken on a new complexion. Land and naval forces are still of great importance in tactical plans and much money and effort is being spent to improve them. Ground forces are being mechanized to the limit, and battleships are being studied closely for improved efficiency, but the real race is in the air, for the rise of air power has upset all of the classical military concepts. It has also changed many diplomatic concepts, for international alliances need no longer be based upon the geographical proximity of the contracting parties. The high speed and long range fighting power of aircraft has changed that picture.

The rise of Germany to a ranking air power has been most spectacular. Long before Germany threw off the shackles imposed upon her aviation development by the Versailles treaty, she was quietly laying the foundation for her present air forces. Thus within a comparatively few months after the final abrogation of the treaty Germany unveiled a military aviation that is probably second to none in Europe. Best evidence that she feels her position in the air is now secure is the openness with which she now shows her magnificent producing plants to foreign aeronautical visitors. Not long since it was impossible to see much of anything of her aircraft production. Today, properly accredited visitors are admitted, nay, invited to visit the large production centers in Berlin, Dessau, Rostock-Warnemünde, Friedrichshaven and elsewhere. True, one does not see any more of the ultra-latest types than can be seen by foreign visitors in any other country, but, actually, visitors are shown more in Germany in the way of modern production than our own Army and Navy permit to visitors from overseas.

German aircraft factories are laid out and operated on a scale and in a manner that would be the envy of an efficiency expert anywhere. The great Henschel plant in Berlin and the huge Junkers works at Dessau are outstanding examples in this respect. A clue to the size of this industry is given by the fact that between 25,000 and 30,000 employees are said to be at work in the various units of Junkers at Dessau and in the immediate vicinity.

The Heinkel plant at Rostock and Warnemünde is not as large as Junkers of Dessau. It is not only producing aircraft in quantity, including the Heinkel 111 bomber and the Heinkel 70 observation ship (the latter machine is now well over three years old but is still one of the most aerodynamically excellent aircraft in the world), but is also operating as a large scale design factory. Best indication of this is in the size of the drawing offices. For Heinkel's actual production work it seems reasonable that a couple of dozen draftsmen could handle specification changes and drawing modifications. Actually there appear to be somewhere between 600 and 800 designers at work in the Rostock headquarters. Row upon row of drafting boards fill the huge drawing rooms on several floors of the administration building. Clearly, this corps of engineers is working on new designs for production, to be farmed out to other producing plants. Junkers is probably operating on the same basis, for at Dessau also one sees drawing offices on the same scale.

Another indication of the scale of the German air armament is given by the size and activity of the tremendous Air Ministry building in Berlin. The building that houses the Reichsluftfahrtministerium seems about the size of our whole Department of Commerce Building in Washington. It contains 2,500 offices and the number of employees and army staff people that are housed in it would be difficult to estimate. It is the brain and nerve center of German aviation and everything that is done is controlled from within it. Herein lies the secret of Germany's spectacular success in military aviation. Whatever the Air Ministry decides should be done is done by the simple process of pushing buttons and without the questionable benefits of long-winded Parliamentary debates. Congressional investigations, or pressure from industrial lobbyists.

Above we have made our estimate of Germany's present air force and present production rate. The figures are not official for one does not ask questions of the sort in Germany (or elsewhere in Europe for that matter). They are based

on personal observations of that part of Germany's productive capacity that I saw in November, 936 It has been necessary to extrapolate to arrive at a total figure for production, but every effort has been made to be conservative

Some evidence was to be seen in Germany that aircraft production had tended to outrun the production of engines If there has been any hitch in the rate of airplane output for 1936, it is probably because motors were the neck of the bottle The great Junker's motor plant at Küthm is now geared up for production of the famous Juno Diesels Estimates of their present output range upwards of 200 300 units per month, but that will doubtless be accelerated In the meantime, there seems to be no lack of BMW Hornets, and other types Certain it is that the latest production models are coming out with engines of considerably greater power than were fitted earlier in the year. The 850 hp inverted 12-cylinder, liquid cooled vee engines, Mercedes Benz and others, are now going into the He III bombers From the evidence in sight today, however, it is a fair guess that whatever troubles may have occurred in engine production, they are well under way to solution and that from now on plenty of motors will be available

The most serious problem of the moment, however, seems to be not machines nor motors, but men Again, direct evidence is lacking, for no official questions were asked and no information was volunteered but I did hear some rumors of pilot shortage Certain it is, however, that large training centers are going full blast all over Germany, that thousands of young Germans are filled with enthusiasm to become military pilots Rumor reports heavy casualties due to the pressure to put pilots through training courses, but I could get no direct evidence on this score It is a matter of record, however, that Germany produced plenty of excellent pilots during the last war, and it is a safe guess that her farsighted Air Ministry has not overlooked the provision of personnel in preparation for the next

Germany's official reason for her high-powered rearmament program is Russia On Nov 29 Khripin assistant chief of the Red Army air forces announced to the All-Union Congress of Soviets that the U S S R. had the most powerful air fleet in the world A safe guess would put her military strength in the 7-8,000 machine range Certain it is, however, that Russia's air forces are operated on a scale at least equal to and probably ahead of Germany's program, for Russia has been at it longer Quantitatively, Russia is probably ahead of any country in the world and although it is common practice to cast doubt upon the quality of her aircraft if the few exhibits that were on show at the Paris Salon are typical, the Soviet Union is not too far behind the rest of the world in aerodynamics and knowledge of aircraft structures

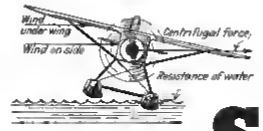
SOME clue as to the air-mindedness of Russia was given by a series of charts which was part of the exhibit at Paris These charts did not disclose anything of any direct military value, but served only to indicate the order of magnitude of Russian aviation activities Comparisons of certain items were given for the year 1933 and the year 1936 to illustrate the growth. For example, parachute jumps from aircraft increased from 1,200 in 1933 to 20,000 in 1936, parachute clubs from 30 to 2 500, gliding schools from 350 to 2,550, gliding pilots trained from 3,580 to 30,000 A particular form of parachute training, jumping from steel towers was started about 1933 That year 2 000 people made jumps, but in 1936 2,000,000 had the experience of coming down in a parachute from the top of a tower A new training method was demonstrated at the Paris Salon by models and by photographs of full-scale operations The embryo parachute jumper stands on a circular metal grating (approximately 5 or 6 ft. in diameter), through which a blast of air is blown upward by a fan driven by a 500-hp motor His parachute is packed in the normal manner When he is ready to take-off he pulls the ripcord, the chute pops in the air blast, and he is carried upward 50 or 60 ft in the air by the open canopy At some such elevation he drifts out of the air-stream and descends to the earth in the normal manner This system simulates free fall more accurately than tower jumping and it is obviously possible for a large number of people to make practice descents in a very short time

No charts or figures were given for the actual number of airplane pilots trained, but calling the number for 1933 100 per cent, the relative number for 1936 is 988 per cent If these figures are indicative of the general advance of aeronautics in the Soviet Union, then almost any guess that one might make of her air force today might easily be too conservative

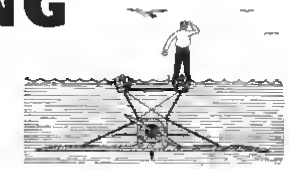
Unfortunately, we were not able

(*Turn to page 70*)

France exhibits new strength at the Paris Show The "wings over-the-world" display in the background is the new Potez 63 Nearer is the latest Marcel Bloch 131, a marked improvement over the Bloch 200 still in production



SEAPLANE HANDLING



The first of three very practical articles on

The Technique of Water Flying

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By D. J. Brimm, Jr.

Illustrations by the author

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IT IS SURPRISING to those who have flown regularly in seaplanes and flying boats that water aircraft have not come into their own long before now. The last year, however, has shown a tremendous boom in the manufacture of floats to be fitted to practically any landplane, and several new amphibians designed for the sportsman pilot or small operator are either in the process of construction or undergoing tests. Private pilots are coming to realize that the seaplane offers many advantages over the landplane from the standpoints of comfort, safety, pleasure and convenience, and commercial operators likewise have found that the slightly lower speed of the float job is usually much more than offset by the ability to land the passenger considerably nearer his ultimate destination than is possible with a landplane The amphibian, of course, is admittedly the ideal from the standpoint of convenience, but many prospective owners do not realize that it must, of necessity, carry a heavy penalty as regards price or performance or both. Obviously, the weight of the landing gear eliminates an equal amount of payload and likewise a two-purpose machine is bound to be relatively expensive This is by no means a criticism of the type, but simply a word of advice to those who expect to find an amphibian in the same price or performance class as a land-—or seaplane with the same power plant.

It is true that the seaplane has its limitations, but they can be materially lessened by skilful handling, and this very skill and seamanship is one of the attractive features of flying water craft For instance, the seaplane pilot cannot lock the brake and rotate the ship around a fixed point as the land pilot does with his wheels, but the land pilot would encounter considerable difficulty in making his airplane, while on the ground, move directly sideways, in a path parallel to the span or ninety degrees to the propeller axis, a maneaver which is easily accomplished with a seaplane if there is any breeze

There are two distinct mental attitudes toward seaplanes by two respective classes of pilots. The first group, comprising the amateur or less experienced flyers of a conservative type, is disposed to regard the water jobs with a certain amount of trepidation. With no brakes, with no way for someone to get out and hold a wingtip, with docks, piling, boats, etc. to keep clear of, these pilots have a rather helpless feeling The second group is composed of those, experienced or inexperienced, who feel that they are better men than any airplane ever built and that a seaplane is just another ship This article, it is hoped, will be a guide and reassurance to the first and a warning to the second

Taxiing on the water

There was a time, before the advent of water rudders, when taxiing a seaplane often presented some rather mean problems Today, however, the ship may be steered on the water almost as easily as a motor boat. With the proper adjustment between the rudder pedals and the water rudders, it is possible, in a fair breeze, to make turns of a radius equal to or less than the span The adjustment referred to is highly important, and should be such that the water rudder has a maximum throw of at least 45 deg Less than this will noticeably decrease the maneuverability

Taxing should always be done in one of three speeds or attitudes (a) idling or slightly above idling speed (Fig 2), (b) in the maximum "nose-up" position (Fig 3), or (c) "on the step" (Fig 4). Any speed between idling and the nose-up position will give the propeller a bad beating, even in fairly smooth water. In light winds, sharper turns may be made at low speed because there is little disturbance behind the float and hence the water rudders have the maximum effect.

IF THE WIND is strong enough to cause difficulty in turning, the elevators should be pulled up and the throttle opened enough to bring the nose to its maximum height as shown in Fig 3. This will require about 70 per cent of the maximum r p m. It will be noted that the center of buoyancy or the center of the submerged portion is considerably further aft than in the position indicated in Fig 2. Hence, there is much more lateral fin area or side area of fuselage and floats forward of the center of buoyancy. As the ship is turning out of the wind, the wind strikes this extra fin area and tends to turn the ship *down* wind. In fact, in taxing cross wind, it is possible to hold the rudder in neutral and "steer" entirely with the throttle. As the throttle is opened and the nose comes up, the ship swings down wind and as the r p m are decreased and the nose drops the tendency is to turn into the wind. The stick or wheel should be held hard back at all times except when running on the step and then there should be at least a slight backward pull on the control column. One caution should be emphasized. If there is any breeze worth mentioning, *never turn into the wind except at idling speed*. A little thought will show the reason for this. As the ship is turned from a down-wind position and comes across the wind, the force of the wind against the side tends to tip the plane toward the outside of the turn. If the turn is abrupt, centrifugal force, acting through the center of gravity, which is, of course, well above the floats, exerts itself in the same direction. As the outer, or down-wind wing drops, the wing toward the inside of the turn naturally comes up and the wind gets under it. If the wind is strong and the turn is quick, disastrous consequences may result as indicated in the headpiece.

When the ship is running on the step, the weight is supported not by the buoyancy of the floats but by their planing action on the surface of the water. In this condition the effect is identical with that of the aquaplane. Anyone who has tried to stand on one while it is at rest knows that such a feat is practically impossible, but as soon as the board is towed by a speedboat it will support two men with ease. To put the airplane on the step the control column is pulled hard back and the throttle fully opened. The nose will rise, and when it refuses to go higher the stick or wheel should be allowed to move ahead to a position slightly back of neutral. In some cases, particularly if the ship is heavily loaded, the procedure may be expedited by pushing the control forward until the ship is in an approximately level position and then moving it back until a slight pressure is exerted. The ship will rock over on the step, at which time the throttle should be closed until the r.p.m. are about 70 per cent of maximum, or less, in some cases. It is advisable to lift the water rudders before going on the step as they are thus spared much abuse and the air rudder provides all the control that is necessary. Gentle turns may be made while on the step, but the inexperienced pilot should take it very easy until he has the feel of the ship in this condition, especially in the case of the twin float seaplane. The same applies to taxing on the step cross wind. This should not be attempted in anything more than a light breeze until the student knows just about how much the particular seaplane he is flying will take.

When taxing in a high wind, it is seldom advisable to go on the step and often better to stay at idling speed as much as possible. No difficulty will be experienced in travelling down wind if the course is *directly* down wind. The ship will try to weather-cock, however, at the slightest deviation. This is particularly true of flying boats which, as a rule, do not have very effective water rudders.

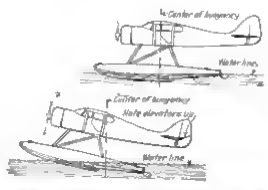
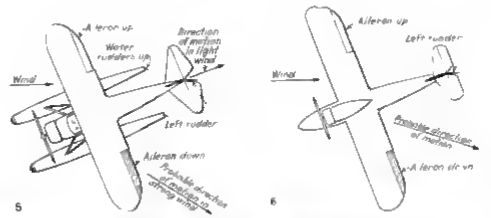


Fig 2—Taxiing at or slightly above idling speed in a Waco.

Fig 3—A Taylor Cub seaplane taxiing in the maximum "nose up" position.



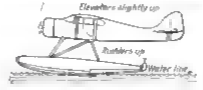


Fig 4—Taxiing on the step in a Douglas observation seaplane.

Ordinarily the boat has greater maneuverability on the step, as the wingtip floats, if properly designed greatly lessen the likelihood of capsizing when making sharp turns. This added ease of handling on the step to some extent offsets the lack of water-rudder efficiency. However, it is safe to say that in the case of single engined ships, the seaplane is easier to handle in a tight spot.

When running on the step a greater backward pull on the wheel is usually required in the case of the boat. Any tendency to "porpoise" or rock fore-and-aft, can be checked by holding the elevators up. The ailerons are used in making turns just as if the ship were in the air and it is surprising what an expert can do in the way of maneuvering at high speed. Anyone who wants a real thrill should ride through a congested harbor with a good boat pilot. But again let the beginner proceed with caution.

There are often times when it is not practical, either because of limited space or high wind and waves, to attempt to turn a seaplane, or boat. Many seaplanes can be capsized by attempting to turn 90 deg in a wind of high velocity. There is no occasion, however, to be unduly timid about trying to turn for if the wind is strong enough to be dangerous turning will require quite an effort and there will be plenty of warning, (by the tendency of the down wind wing to drop) so that the pilot will have ample time to decide to maneuver by other means. In such cases, the ship may be sailed in almost any direction by proper use of the motor, the rudder and the ailerons. In sailing backwards it is usually best to lift the water rudders but if moving sideways or diagonally forward they may be either up or down and it is usually better to have them down. Sailing may be done either power-on or power-off depending on conditions. The lower the minimum idling r.p.m. the better, especially in a light breeze and needless to say, a self starter is highly desirable, if not essential.

When sailing in a normal wind with the engine dead, a seaplane due to the keel effect of the floats usually sails backward in the direction the tail is pointed, or parallel to the floats. In a high wind it may move diagonally backward toward the side to which the nose is turned, or at any angle to the float. A little experimenting will indicate quickly just how the strength of the wind will affect the ship. A flying boat, since it has a relatively smaller keel surface usually moves toward the side to which the nose is pointed regardless of the strength of the wind. No absolutely definite rule can be laid down for all ships, as varying keel surfaces and different sizes of fuselages produce different results. It is usually helpful to use opposite aileron—that is, move the stick to the left when right rudder is applied and vice versa. The diagrams in Figures 5 and 6 are practically self explanatory. Note particularly the position of the air rudder in each case and remember that the water rudders are up. When sailing in a light breeze it is often helpful to open the cabin doors and pull the wing flaps down so as to increase air resistance.

With the engine running, if the idling speed is sufficiently low for the pull of the prop just to offset the tendency of the ship to drift backward referred to as "neutral r p m" in the diagram, the seaplane or boat may be moved directly sideways toward the direction the nose is pointed as the wind blows against the fuselage, which has the effect of a sail. This maneuver is illustrated in Fig 7. Of course, if the speed of the engine is slightly increased, the ship will move diagonally forward to the pilot's left, and if the r p m are decreased it will move diagonally backward, also to the left. Various combinations of power-on and power off sailing may be used to put the ship into quarters which to the uninitiated would seem absolutely inaccessible.

(To be continued)

Georgs Prudden

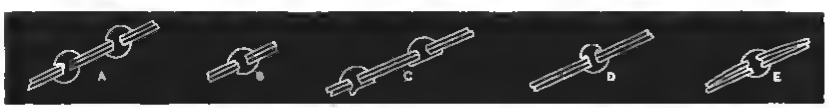
II.
DESIGN for PRODUCTION

The second of two reports on the S.A.E. Production Sessions by Edward P. Warner

LOVERS OF STRIFE had looked forward eagerly to Mr. Richard C Gazley's appearance on behalf of the Bureau of Air Commerce to talk on "Factory Facilities and Federal Regulations," for whispered promises had it that Mr. Gazley would propose something sensational and that the industry would rise in united and horrified indignation. The promised scrap never materialized. The paper noted the impossibility of making a really complete inspection of an airplane for airworthiness without tearing it all to pieces and then wrecking each individual piece by testing it for strength, concluded that the only substitute for such drastic treatment was to repose trust in the manufacturer so that "the manufacturer effectually functions as a self-contained part of the Bureau of Air Commerce and there is no logical reason for not recognizing his ability to handle his own detail inspection work."

If the Bureau were to take that point of view, it must keep an eye on factory methods and organization. Many horrible examples of bad production practice proved the necessity of such control, but for most of them it was fortunately necessary to look back several years. As production methods became more standardized and as the dependence placed on hand work diminished, the Bureau found its task simplified, but it must still be particular about certain details of organization. Mr. Gazley thought that every factory should have a production manager, a chief engineer, and a chief inspector who should be free of each other's control, except that the chief engineer might supervise either of the other two.

The only indignation at this modest statement of objectives came from Leighton W. Rogers, president of the Aeronautical Chamber of Commerce, who was alarmed at the implications for the future. Mr. Rogers protested that the Department of Commerce had no legal authority to regulate aircraft factories and he feared they might be acquiring it by indirection. He thought Mr. Gazley's views on production practice far too rigid where they prescribed that all bolt holes should be reamed on assembly, that all inspectors should be furnished with magnifying glasses and micrometers, that no metal parts should ever be held in a vise, or locally heated for bending or straightening, and the like. Some of these requirements he found not only excessive but actually contrary to accepted good practice. Mr. Gazley agreed that his statements were generalizations and that they were intended to have no regulatory force in the form



that they took in the paper. The smoke of controversy blew away with the help of soft words from Mac Short of Stearman (who thought that the manufacturer should be good enough to make detailed inspection by government officials really superfluous), from Herbert Thaden of Fairchild (who thought that regulation had done a vast deal of good and that someone should be in a position to maintain a detached and dispassionate check on the development of design and production practice) and Edward P. Warner (who believed that a little quoted section of the Air Commerce Act in fact gave the Bureau the authority to do all the factory regulating that it might desire and further believed that as a practical matter a considerable measure of watchfulness over factory method and organization was essential if an A.T.C. were to have any meaning at all).

C. H. Schildhauer of Pan American, M. Gould Beard of American Airlines, and Commander F. W. Pennoyer of San Diego spoke for the airplane users. Mr. Schildhauer told of the routine of Pacific operation of which the first 500,000 miles had just been finished. Much of the story has already appeared in AVIATION for December, 1936.

Mr. Schildhauer's principal demand on the aircraft industry for the future was for quicker takeoff and for more seaworthiness.

Commander Pennoyer summed up the Navy's maintenance problem in statistics. The ships ashore and in the fleet must handle 1300 airplanes; they total eight complete overhauls a week with a prospect of having to double that within the next five years; and standardization is hampered by the current carrying on the naval roster of 93 different models of airplane and 53 different types of engines. Complete tear-down and overhaul take place at varying intervals, from 12 months for the catapulted observation plane to 3 years for the flying boat. The time allowed for an overhaul is from two to four months and every part is stripped to bare metal. The principal complaints of the Assembly and Repair officers against the designer were: liability to corrosion (dissimilar metals in contact to produce electrolytic action being the worst offenders), difficulty in disassembly (with a horrible example taken from a machine on which the tail surface had to be completely dismantled in order that an elevator ball bearing might be removed), lack of excess stock for reaming worn holes to oversize, the use of non-standard materials, impossible to duplicate in the field, and defective welding, which could have been caught in the first place by magnaflux inspection.

DISCUSSING THE PAPER, Commander Price underlined a few of its statements relative to the difficulty of maintaining ship-board airplanes. There was a shortage of fresh water for washing down and removing salt deposits. Engineers had a bad habit of depositing thick layers of soot on the airplanes which reposed on deck. Electrolytic action had been shockingly rapid on such machines and it was of the utmost importance that steel screws in light alloy members or steel bolts with brass cotter pins should be avoided.

Mr. Beard described the problems of testing transport planes. Eight years ago he had found it possible to go through the complete acceptance test for a standard production ship in half an hour of flying. At present it took him two hours of flying to make such an acceptance with a crew of four kept busy during every minute of it.

Constant speed propellers and their adjustments were largely responsible for this increase in time. The propeller must be checked not only for normal functioning under all sorts of conditions but also against the possibility of getting into trouble if it stuck in either low or high pitch. Incorrect adjustment of the springs in the hub might allow an ungoverned racing to dangerously high r.p.m. in a dive.

Mr. Beard thought that vibration studies ought to be eliminated from flight testing by using electrical vibrators on the ground to test the ship's characteristics. On one occasion he had had to do over 100 hours of flying in a single airplane to get the vibration localized.

Among the minor, but very serious, problems of transport design were the failure of tail-pipes and the heating of carburetor air. Pipes of oval section, or flat sections of boilers, had been particularly subject to failure because of the brittleness of the stainless steel used at high temperatures and of the distortion of forms by expansion. As to carburetor heating, Mr. Beard strongly recommended the measurement of mixture temperature in the adapter between the carburetor and the engine, as that took account of the effect of turbulence and of the heat of vaporization of the fuel. The use of heat increased the required range of the mixture control and standard controls sometimes proved insufficient.

In the interests of easier instru-

(Turn to page 73)

Above—W. Bailey Oswald (left) and a group of airplane operating men.
Below—Nine good examples of bad practice in driving rivets in thin sheets.

EDITORIALS

AVIATION
JANUARY 1937

IN DEFENSE OF RADICALISM

▶ By one of those curious twists of fate that seem to control the destinies of the human race, a man who had dedicated his life to the development of a safer form of aircraft, lost it when a transport struck a house on the edge of a British aerodrome. His work, which had been inspired by an airplane crash in 1923, ended in an airplane crash in 1936. Juan de la Cierva,—mathematician, inventor, scientist,—lived long enough, however, to see his idea of a rotating wing aircraft develop into a practical form in the face of long and continuous opposition. He died just as the autogiro was beginning to find its true place in the aeronautical picture.

Whatever one may think about the future of this or of that form of aircraft, aviation cannot afford to lose men like Cierva. As in most forms of human endeavor, we need a few radicals to keep the pot boiling. Otherwise we get bogged down in tradition and progress lags. Distinction must be drawn, however, between the crackpot, and the man who has a sound scientific background for his radicalism. Necessary, of course, is a thorough knowledge of the accumulated experience of the past. It is in the new application of basic principles that fresh fields for exploration are opened up.

In aircraft design the modern tendency is definitely toward standardization. Even casual visitors at the recent Paris Show were struck by the trend toward a common formula. As is suggested elsewhere in this issue, almost the only thing left for design originality at the moment is in the disposition of the tail surfaces. But even the best of our present-day aircraft leaves much to be desired, and no one can be certain yet that the one best type has been evolved. That may come in time, but the millennium is yet many years away. The great danger of the moment is to permit our design thinking to fall too readily into rigid patterns. We must not close our minds to new ideas.

The aviation industry all over the world needs non-conformists to keep it away from a too complacent acceptance of formulas. There is still plenty of room for minds of the Cierva type.

NATIONALIZED CONFUSION

SEVERAL MONTHS AGO we sounded off on the subject of the then proposed plan of the French government to nationalize its aircraft industry along with its general munitions industry. Now the project has actually been put into operation and we have recently seen something of its workings. Admittedly our view of the French aircraft industry was very brief and quite superficial, but we came away with a distinct impression of a great confusion. So far, only one of the projected four production districts has been nationalized. Already grave differences of opinion seem to have arisen between factory owners and the government over the question of a fair price to be paid for control. No one seemed to know quite what the next move might be. Confusion seemed to be heaped upon confusion.

What we saw and heard confirmed our belief that, for the present, and probably for many years to come, aviation will advance more rapidly in the hands of competing private ownership rather than under direct government control, unless we are willing to go whole-hog and accept the theory of a totalitarian state under a dictatorship.—And we in America would never be ready to admit the wisdom of such a move.

For her own sake, however, we hope that France will be able to straighten up her aeronautical industry problem before a major European crisis develops.

PILGRIMAGE

NOT MANY WEEKS AGO we stood before a curious looking contraption suspended from the ceiling of a crowded room in London's South Kensington Museum. Here, almost within touching distance, was the actual machine in which the Wright Brothers had launched aviation history from the sands of Kitty Hawk. Through the din and the clatter of the throngs of Sunday afternoon sightseers that flowed constantly beneath those flimsy wings we could almost hear the Apocryphal Voice saying—"Take off the shoes from thy feet for the place whereon thou standest is holy ground."

We have just celebrated the thirty-third anniversary of that famous flight. The nation has done well in honoring the Wright Brothers living and dead. But it should not be necessary for Americans to travel overseas to stand before the monument of their success.

It is out of place here to go into the details of the quarrel that exiled the Wright airplane from its homeland. That is now so ancient that it is almost forgotten, and the sooner it can be buried the better. But steps should be taken, and soon, to bring the Wright airplane back to America before some accident of war or of peace destroys it forever.

Somewhere in our national capitol a suitable building should be erected where the Wright machine might be enshrined,—where the masses of people, not the occasional traveller, may see it and be inspired to keep America first in the air.

Douglas DF Flying Boat

Cyclone powered 32 passenger craft has over 3000-mile range

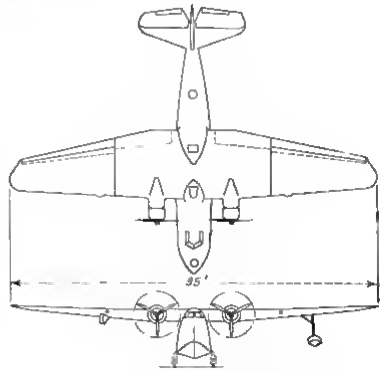
ON ONE OF OUR RECENT EDITORIAL EXPEDITIONS to the West Coast Chief Engineer Arthur Raymond of Douglas afforded us the opportunity of a preliminary glimpse at one of his latest designs then in the course of construction. It was the big DF long range flying boat. At that time the work was not far enough along for us to publish accurate technical information. But just as we were about to close our January issue the full story became available and we decided to hold the presses in order to get it in.

The Douglas DF represents a remarkable combination of the trinity of virtues of transoceanic flying boats—operating economy, comfort, and range. With only two Wright Cyclones (SGR-1820-G2) it furnishes luxurious accommodations for 36 persons, and carries sufficient fuel for a range of 2700-3280 miles. Maximum speed is 185 m.p.h. (6,500 ft.) and cruising speed, 167 m.p.h. (75 per cent power at 9,000 ft.).

A high wing monoplane with retractable wing tip floats, the DF is of semi-monocoque construction. There is no central keel in the hull but a large extruded central keelson is used. Loads on the bottom are transferred to the transverse frames through extruded bulb angle stringers spaced 4 in. on centers. The transverse frames are built up of side and bottom channels and webbing sheets 0.020 in. thick, reinforced with bulb angle stiffeners and gussets. Bottom plating varies from 0.040 in. at the bow to 0.051 in. at the forward step and 0.040 plating is used for the after bottom. Side longitudinals are bulb angle sections. Flush rivets are used on the bottom while all other rivets are of the brazier head type.

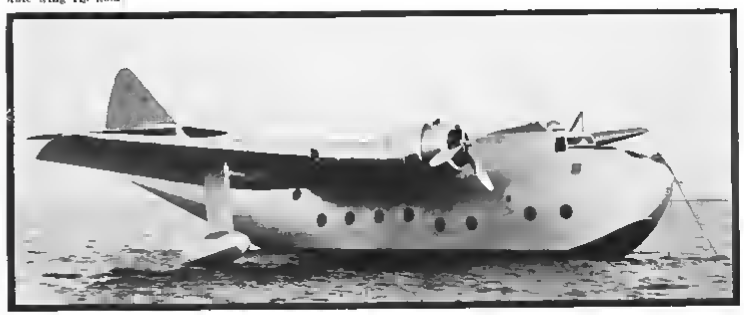
Aluminum alloy is used exclusively in the hull structure excepting the stainless steel snubbing post on the bow. All highly stressed fittings are machined from aluminum alloy bar or plate excepting the beaching gear fittings which are aluminum alloy castings and are X-rayed for defects before fabrication.

The hull is divided into seven watertight compartments, and the bulkheads between passenger compartments may



Flying Equipment — *What's new in aircraft, engines and major accessories*

The Douglas DF riding at anchor. Note the retractable wing tip float.



be closed by removable watertight sills which may be installed in five seconds each. Hinged watertight doors are located at the forward and after ends of the passenger space. There are three hatches and three emergency exits.

Two spar construction is used in the wing which consists of a center section integral with the hull and two outer panels with detachable tips. Machined chrome molybdenum steel fittings, insulated from the aluminum alloy by impregnated fabric are used to attach the wing panels to the center section. Structural material in the wing is all aluminum alloy excepting a portion of the covering aft of the rear spar where fabric is used. The metal part of the wing is built up of plate girder spars with extruded cap strips and vertical web stiffeners at each rib attachment, and channel section ribs. Drag loads are taken by beaded metal skin with the beads running fore and aft. The fabric covered portions are built up of light sheet metal spars stiffened with flanged lightening holes, and formed angles at the rib attachment points. Ribs are of tubular truss type excepting those carrying hinge fittings which are of heavier channel construction. Fabric covered sections are bolted to the metal covered sections with nickel steel aircraft bolts.

Fabric covered trailing edge flaps extend across the center section while Frise ailerons of similar construction extend over the entire panel as far as the detachable tips. Trimming tabs are provided in the right aileron and in rudders and elevators.

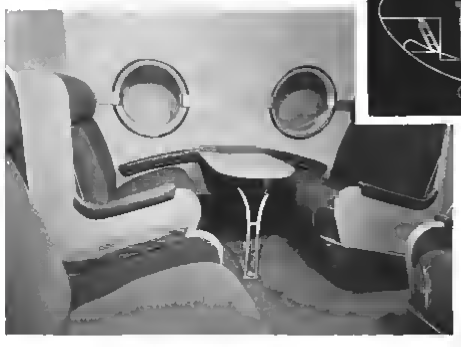
Tubular aluminum alloy spars, stamped ribs and fabric covering are used in the elevators and rudder. The horizontal and vertical stabilizers are of metal covered, multi-cellular construction. The hydraulically retracted wing tip floats are similar in construction to the hull. In retracted position they are about one half exposed to the air stream lying close to the wing.

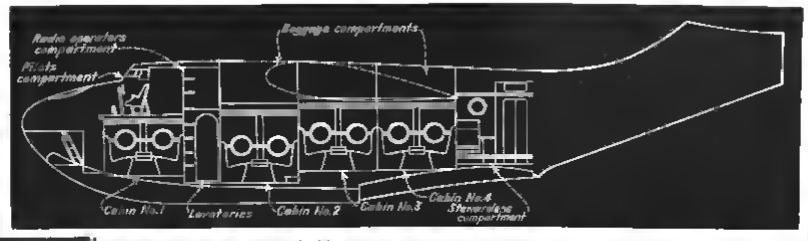
A three wheel beaching gear is used to handle the ship on the ground. Built into each wheel unit is a flotation tank with sufficient buoyancy to float the unit. Solid rubber tires are used. In attaching the units each one is floated to its proper position and two lugs are inserted in their sockets in the hull. Then enough water is allowed to enter the tanks to sink the gear to the proper position for locking. The tail wheel is attached in a similar manner except that there is only one locking pin. The fork slips into a socket in the hull bottom and the pin is inserted in a 90 deg turn of a crank. Locking may be accomplished from inside or outside the airplane. This arrangement greatly simplifies launching.

Cabin space is divided into four passenger compartments (eight seats in each), crew quarters forward and above the first passenger compartment, and a stewardess compartment aft of the rear passenger cabin. Two lavaratories are provided between the first and second passenger cabin. Included in the accommodations of the stewardess compartment is a buffet with dry ice chest and other facilities. Heated air enters the cabins near the ceiling and passes out through floor grills to the bilges and thence upward between cabin lining and hull plating and out through ramproof ventilators along the upper deck. This system prevents condensation and moisture collection between cabin lining, soundproofing and hull structure.

Weights and performances are as follows:

Weight empty	16,850 lb
Useful load	11 650 lb
Gross weight	28,500 lb
High Speed (@ 6 500 ft. altitude)	185 m.p.h.
Landing Speed	65 m.p.h.
Take-off Full Load in Calm Air	35 sec
Cruising Speed 75% power @ 9 000 ft.	167 m.p.h.
Absolute Ceiling	16,000 ft
Range, capacity fuel, no reserve @ 9,000 ft. 75% power	2,700 mi
Range, capacity fuel, no reserve @ 9,000 ft 62 5% power	2,880 mi
Maximum Range, capacity fuel no reserve @ 9,000 ft.	3,280 mi

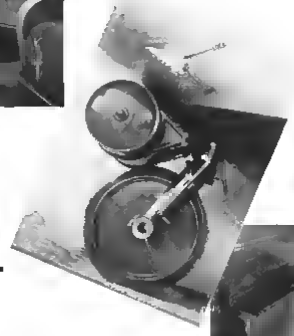




Left: One of the four lounging compartments for passengers.

Above: The general interior layout of the DF Flying boat.

One of the important bulkheads (No. 522) showing the type of construction employed.

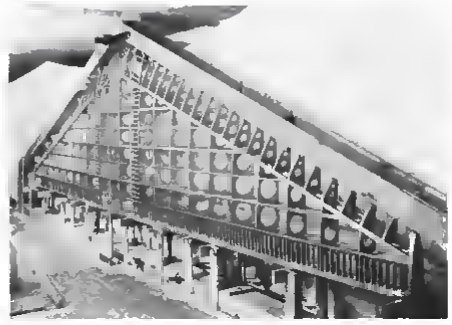


Two views of the floatation type beaching gear. Note the buoyancy tanks. The tail wheel unit is shown at the left.

Flying Equipment

The material used in the structure of the ship is generally 24 ST and 24 SRT Alclad, anodically treated.

Fuel is carried in six elliptically shaped welded aluminum tanks each of 270 gal capacity all mounted in the center section.



Structure of the horizontal stabilizer in its jig.

Lear Motoreel

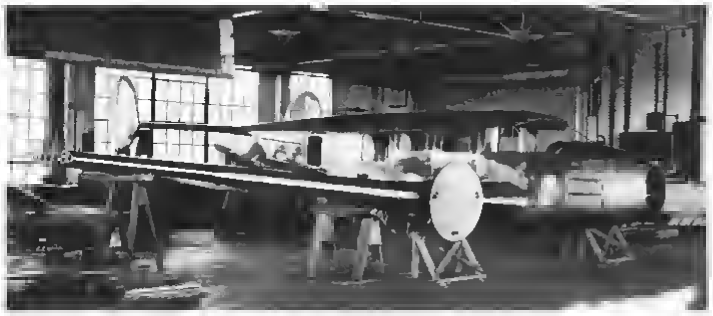
Remotely controlled antenna reel reduces radiation losses in radio transmitters

A REMOTELY CONTROLLED REEL for trailing wire antennae, which is located near the transmitter in the tail of the ship has been introduced by Lear Developments Inc. (New York). The Learadio Motoreel consists of two parts, the reel unit, and the remote control unit, and suitable connecting cable. Weight of the complete equipment including wire, swivel fish, remote control reel unit, connecting cables, fairleads etc. is less than 10 lb.

In order to reduce radiation losses due to lead wires, the reel unit is placed next to the transmitter and the fairlead protruding from it is set up to emerge directly below and out of the belly of the ship. Another advantage of this arrangement is that it makes the whole length of the antenna effective for transmission. The swivel fish is so arranged that when the antenna is completely retracted, there is a short flexible piece of wire still extended for short range communication when approaching airports for a landing and for communicating with the control tower when the ship is on the ground. An antenna current meter is used with the remote control unit to enable the pilot to select a length of antenna giving maximum current circulation for any particular frequency. In multi-frequency transmission the pilot can match his antenna for any number of different frequencies and get maximum radiation in each case.

With the Motoreel it is possible to pre-select any given length of antenna, turn the "operate" switch to the "out" position, and the reel will immediately pay out the selected length of antenna and stop. Warning lights on the control unit indicate when the wire is extended and remain on until it is retracted. Complete retraction is accomplished by turning the control handle to the "in" position. When the antenna is completely retracted with the swivel fish against the fairlead the warning lights go out.

By the use of this control unit the pilot is relieved of the responsibility of operating an antenna reel and of attempting to estimate the length of wire extended. Anything of the sort that simplifies his duties is all to the good.



Twin Engined Beechcraft M18

All Metal Airplane for executive transport and charter operation

WHEN Walter Beech and his Chief Engineer, T. A. Wells set out to build an airplane for the traveling business man and charter operator they began by making a survey of prospective users. Based on a consensus of opinion the design they evolved as a result satisfies the requirements from the all metal structure and soundproof cabin down to the electric razor outlet in the restroom compartment.

Model 18 Beechcraft is a twin-engine low-wing monoplane of metal semi-monocoque construction with electrically retracting landing gear (including tail wheel). Although interior arrangements can be modified to suit the purchaser, the standard form provides for six passengers in the cabin and two pilots forward. An alternate club-car arrangement features two easy chairs, a long comfortable lounge, and space to install cupboard, desk, or other similar conveniences. Soundproofing material for the cabin is Seapak with Kapok felt around openings in the wall. The ventilating system is controlled by the co-pilot with heat entering the cabin from ducts along the wall at the floor. In the pilot's compartment a molded safety glass windshield enhances the exterior lines at the nose of the ship and provides excellent vision for the operator. The three sections of the windshield are rigidly fixed and vision in bad weather is provided by a wiper which clears the center panel. Hot air ducts keep the glass free of ice and sleet formation. Two baggage compartments are provided, one in the rear of the cabin and accessible in flight and the other in the nose of the fuselage.

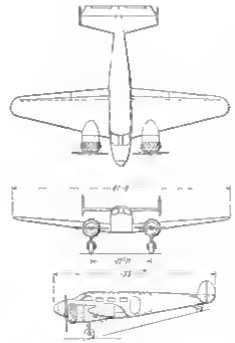
In the center of the instrument panel are radio receiver and transmitter. This position eliminates the difficulties and complications of remote control. Individual dual wheel control is provided and the seats are adjustable. Fire extinguishers in both engine nacelles are controlled from the cockpit.

Standard engine equipment consists of two Wright 760-3-2 7-cylinder engines developing 420 hp for cruising at 11,500 ft. and 700 hp for take off, or two Jacobs L-5 7-cylinder engines developing 420 hp for cruising at 8,000 ft. and 600 hp for take-off.

Construction of the fuselage follows the usual pattern for semi-monocoque structures. The structure consists of built-up bulkheads and extruded section stringers with smooth skin riveted to the framework. To carry the stresses imposed by the engines, landing gear and wings, a single heat treated steel tube center section spar has been tied into the fuselage structure. By this construction, it is possible to place the spar just ahead of the front cabin bulkhead, leaving the cabin entirely unobstructed. The remainder of the center section structure consists of aluminum alloy ribs, a light rear spar for the flap hinge, stringers and skin. Behind the center section spar on each side of the fuselage are 80 gal. fuel tanks.

Flying Equipment

Tail surface structure in the course of construction



A composite single spar of steel tube and aluminum alloy construction is used in the wing. The transition from welded steel tubing to aluminum alloy takes place about half-way along the semi-span. To the spar are riveted continuous aluminum alloy ribs, tied together by a light auxiliary spar to carry the aileron and flap hinges. Extruded duralumin stringers extend spanwise in the wing structure. The wing section is the NACA 230, tapered three to one. 3½ deg. washout at the tip is used.

Ailerons are of conventional construction with fabric covering. A trimming tab is mounted on the left aileron unit. The structurally similar flap extends inward from the aileron to the fuselage. It is operated by an independent electric motor to facilitate the use of flaps for take-off. The double rudders and elevator are built of welded steel tubing covered with fabric and have trimming tabs mounted on one of the rudders and on each half of the elevator. Stabilizer is faired into the fuselage contour.

The material throughout is 52 SH alloy and a modified head 53 ST rivet is standard. These rivets may be driven cold in a heat-treated condition and have a high corrosion resistance.

The retractable landing gear unit consists of a single forked leg attached to an arm which slides in a tube within the nacelle. In the retraction process the leg swings backward into the nacelle. In this position the wheel projects slightly outward. The air oil shock absorber has a vertical travel of 8 in. which, added to the resiliency of the Goodyear 29x13x5 low pressure tire, allows a landing descent rate of 600 ft. per min. without exceeding two-thirds of the design load. Landing gear and tailwheel are retracted electrically in four seconds and may be operated by a hand crank in emergencies.

General specifications for the ship with alternate power plants are as follows:

Span, 47 ft. 8 in.
Length, 31 ft. 11 in.
Height, 9 ft. 5 in.
Landing gear tread, 12 ft. 11 in.
Gross weight, 6,500 lb.
Empty weight with standard equipment. Wright engines, 4,100 lb.; Jacobs engines, 3,920 lb.

Performance (full load estimated)—Wright engines:
Cruising speed, 185.5 m.p.h. at 11,500 ft.
167 m.p.h. at sea level.
Climb at sea level, 1,250 ft. per min.
Service ceiling, 20,000 ft.
Single engine ceiling, full load, 8,500 ft. density altitude.

Jacobs engines:
Cruising speed 180.5 m.p.h. at 8,000 ft.
167 m.p.h. at sea level.
Climb at sea level, 1,200 ft. per min.
Service ceiling, 19,000 ft.
Single engine ceiling, full load, 8,000 ft. density altitude.

Range (full load including equipment, cruising speed):
Jacobs engines, 8 persons, 465 mi.
Jacobs engines, 4 persons, 1,000 mi.
Wright engines, 8 persons, 475 mi.
Wright engines, 4 persons, 1,070 mi.

Rearwin Sportster

Latest model has 90 hp. LeBlond engine and many detailed refinements

DR. ARTHUR LAROES, newly appointed representative for Rearwin Airplanes, has told us of some of the detailed improvements in the new Sportster model. Most fundamental change is found in the power plant which is a new LeBlond model developing 90 instead of 85 hp. The ship is also available with the 70 hp. LeBlond and 90 hp. Warner engines.

Airplane tourists will be interested to know that the rear seat has been redesigned to carry baggage under as well as behind the seat. Colored pyralin has been installed in the overhead windows to save the cabin interior from heat rays in tropical operation. Standard equipment now includes an airspeed indicator which the manufacturers consider an absolute necessity.

Externally the ship remains unchanged, but the finish has been improved. All metal parts now receive a baked-on enamel finish to prevent chipping.

In general dimensions the ship remains the same as the other Sportster models. Performance is as follows:

	70 hp LeBlond	90 hp LeBlond
Maximum speed	115 m.p.h.	123 m.p.h.
Cruising speed	103 m.p.h.	110 m.p.h.
Landing speed	38 m.p.h.	38 m.p.h.
Cruising range	500 mi.	500 mi.

	90 hp Warner
Maximum speed	120 m.p.h.
Cruising speed	107 m.p.h.
Landing speed	38 m.p.h.
Cruising range	500 mi.

Although the new Rearwin Sportster has not changed externally it embodies many detailed refinements

AVIATION January, 1937

"THIS will give you *transport performance*"

AIRLINES buy on a performance basis. That is why many of the leading transports use Texaco Airplane Oil.

This same oil as used by leading airlines is available to you at all leading airports. You get power . . . longer periods between oil changes . . . greater dependability.

New, improved refining methods had to be devised before it could be made. Harmful gum, sludge, and carbon forming elements are removed.

Scientific tests, by impartial authorities, have proved its superior quality.

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For rocker-arm lubrication, Texaco Marfak is outstanding. Marfak clings and protects against metal-to-metal contact regardless of pressure. It does not leak or squeeze out. Rugged, stringy, adhesive, it gives the greatest protection against wear.

"This is the oil that is used by the transports — TWA, Braniff, Pennsylvania, Hanford, Northwest, Wyoming, and others. It is the best for your plane, too."

TEXACO

TEXACO *Aviation Products*

Buyers' Log Book

What's New in Accessories, Materials, Supplies, and Equipment

Refueling Truck

Developed by Columbian Tank to keep water out of gasoline

A TANK TRUCK REFUELING UNIT designed particularly to keep water out of the gasoline in the dispensing process was built recently for the Standard Oil Company of Louisiana to specifications of American Air Lines by the Columbian Steel Tank Company, Kansas City, Mo.

Specifications called for a 1,500 gal. conventional type unit, divided into three compartments; oval shaped, with extended partition mounting and three point support, fully enclosed side cabinet, skirting, rear cabinet to house reels, meters and all operating controls; with service platform on top of the cabinet. Top and sides are removable.

Fire equipment includes two 15-lb CO_2 extinguishers mounted in pockets in the skirting at the rear and two quart hand extinguishers, one in the cab and the other on the floor inside the control cabinet at the rear.—AVIATION, *January, 1937*

American Airlines using the new Columbian Tank Truck at Memphis, Tenn.

Circuit Breaker

Low cost unit developed by Square D Company

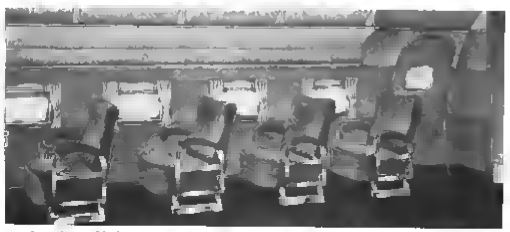
FOR AIRPORTS AND SHOPS where economy is the watchword, a low cost line of Multi-breaker lighting panelboards has been developed by the Square D Company (Detroit, Mich.). Besides its low cost the new unit is compact and small in size, being but 15 in. wide and 4 in. deep. Wiring gutters are 4 in. wide.—AVIATION, *January, 1937*

Light Mohair

New material by Massachusetts Mohair has low weight

FOR UPHOLSTERY in its new club car Douglas DC-3's, American Airlines has specified Falcon fabric, a new light weight mohair recently developed by the Massachusetts Mohair Plush Company (Boston). Although much lighter in weight than the standard railway car variety which Massachusetts Mohair has manufactured for nearly 50 years, the new Falcon cloth has greater durability.

Because of its deep pile, Falcon cloth is sound absorbing and slip-proof. It is well ventilated and does not hold heat or cold. It is available in any color or pattern to liven up airplane interiors. Of particular interest to airline operators is its ease of maintenance. All stains are easily removable and the material is washable with soap and water.—AVIATION, *January, 1937*



American Mollnes club car interior with Falcon upholstery, toe seats

A-40 Accessories

Cylinder head and muffler-heater are now available

TWO NEW ACCESSORIES for Continental A-40 engines have been developed recently by Air Transport Equipment Inc. (Garden City, N. Y.). The first is a reinforced cylinder head of aluminum alloy guaranteed not to crack at the spark plug holes. It has the same weight and compression ratio as the regular equipment.

The second item is a combination air heater, muffler and cabin heater, weighing only 3½ lb., for Taylor Cubs and similar ships. The unit is so designed that no fumes enter the enclosure. A complete line of A-40 parts is also handled by the company.—AVIATION, *January 1937*

Operators' Corner

An exchange of ideas on the problems of the commercial aviation industry

QUESTION 20: Do you believe that a special license should be required for flying instructors? If so, what qualifications should be required? Should the number of hours needed be the same as that for the transport license or greater? Should some estimate of ability to impart knowledge be included in the requirements?

Some teachers never learned

YES. I DEFINITELY DO BELIEVE that a special license should be required for flying instructors. The license should not be granted to anyone with less than 800 hours, and preferably 1,200 or more.

In my opinion 95 per cent of the accidents we have these days are caused by lack of experience and/or improper or incomplete instruction. I am amazed at the large number of transport pilots who know practically nothing about flying—the fact that they still manage to get up and down and remain alive can be attributed only to non-failing motors and the continuous intervention of a Divine Providence. We have had here any number of pilots of so-called vast experience whom we have refused to check out for solo, even on our training planes, until we have given them quite a few hours of dual. Why?—because they did not know how to fly safely: they were erratic, they made long dragging power approaches, they had absolutely no idea of precision without power,—they blew up completely when given a cut gun. I have had men with 500 hours who had never been taught, *had never even learned*, the use of opposite aileron in taxiing!

Yet these men are instructors! Now, I ask you, how in the devil can they impart information to others when they don't even know it themselves?

Certainly, there should be a stiff test of ability to impart knowledge. Even among the bare 10 per cent of licensed pilots who know WHY an airplane flies as it does there are some who cannot teach some who are not aware of the innumerable small courtesies-of-the-air that add to safety, and even some whose flying actually cultivates recklessness and carelessness in their students.

Among the various breeds of flying school graduates I have seen I consider the graduates of the United States Navy—Pensacola, the best as regards not only flying ability but also thorough grounding in the fundamentals. Yet I would apply this 800 hour minimum even to them, as no man really knows what and why he is doing something until he has been seasoned by being on his own long enough to have stopped aping his instructor, and started thinking by himself.—CAROL O. CHADEA, *chief pilot, O. J. Whitney, Inc., North Beach Airport, Jackson Heights, N. Y.*

Test Teaching Ability

THIS COMPANY, after ten years of training students, is heartily in favor of a special instructors' rating. An instructor should first hold a transport license. He should then be required to show a certain number of hours of front seat flying. He should have to pass a special written test regarding the teaching of beginners. He should then be given a special flight test in order to show his ability to teach the beginner.

To top all this, a definite check should be kept on his dual training time. The number of students soloed, the record of such solo flights and the record of the student as he applies for his amateur and private licenses.

There should be some sort of fine imposed on the instructor who turns out solo an unfinished student, or one who cannot pass his test for amateur or private license. This fine should consist of his losing his rating, etc.

The instructors' rating should be necessary before *any* pilot be allowed to try and teach a pay student to fly. It would mean a better class of solo students, which, with the increase in student flying, is going to be very important to the industry.

This all seems to put quite a burden on the instructor. Still, he is the one that starts the beginner on his flying career. He should be forced to "follow through" with each student.—H. E. MARTIN, *manager Dennison Airport Operating Company, Dennison Airport, Atlantic, Mass.*

Solo Supervision Needed

I THINK A TRANSPORT LICENSE IS SUFFICIENT for an instructor but there are cases when instruction is given by pilots who have this limited amount of time and of course a few of them are not such good instructors. I still think any good transport is qualified to give good instruction.

The real trouble, I think, is with letting the students go without proper supervision after they have soloed and not with the actual type of instruction given in most cases.—F. E. MACHESNEY, *Machesney Airport and School, Orchford, Ill.*

Transport is Adequate

WE DO NOT BELIEVE that a special license should be required for flying instructors. The transport license is sufficient to qualify a man to teach.—HUGH C. ROBBINS, *president, The H. C. Robbins Company Municipal Airport, Cleveland*

Next Month's Question

QUESTION 21: Should a private pilot be allowed to carry and instruct students in licensed aircraft merely because he is not being paid? Have you had any experience with this problem? What is your solution?

How then do you interpret Paragraph E, Section 46 Bulletin 7, of the Air Commerce Bureau which states that a private pilot may not, for hire, instruct students?

(Submitted by H. E. Martin, Manager Dennison Airport Operating Co., Atlantic Mass.)

News of the Month

Highlighting recent events in the aviation world

***Domestic Transport. . . . Fall traffic reaches all-year peak; November passenger mileage increases 130 per cent . . . . Douglas DC-3's go to several lines. . . . October express revenue up 60 per cent over same month last year. . . . Eastern hints at further expansion in Southwest. . . . Pan American pays 60 cents a share.**

***Army, Navy, Coast Guard. . . . Stearman gets Army order for 23 Trainers at $146,720. . . . Navy buys 249 Pratt & Whitney engines for $2,743,721. . . . Secretary Perkins denies exemption of airplanes and aircraft materiel from Walsh-Healey provisions.**

***Industrial. . . . Nine month production up 68 per cent over same period last year; export business increases. . . . Lockheed gets new foreign orders . . . Waco submits low bid on Coast Guard ships. . . . Stearman-Hammond opens 25,000 sq.ft. factory.**

***Airports, private flying. . . . WPA airport program more than 50 per cent complete, $56,000,000 is authorized . . . Private planes represented extensively in New York Show exhibits. . . . Miami meet attendance large in spite of bad weather.**

Traffic Peak

New equipment and an October peak raise hopes for a busy winter for the domestic airlines

IN PAST YEARS airline traffic has been violently seasonal, with a sharp peak in July or August, a heavy slump in the winter months. This past October, however (the latest for which complete returns are available) showed a new all-time high and brought the peak later in the year than it had ever been before. Airline operators are looking forward to a winter which will carry itself.

Statistical soothsayers are unable to put an unequivocal finger on the cause, but point to a number of straws-in-the-wind: the summer was devoted largely to selling better service and the advantages of new equipment, travelers-in-a hurry and just plain travelers are beginning to accept—and use—air transportation without thinking twice (this habit pushed the country's load factor up to 68 per cent in October, enabled the year's average to stay above 60 per cent); through coast-to-coast sleeper service, which was introduced by American Airlines using Douglas DST's, has been increasingly popular. Sleeper equipment (also Douglas DST) will shortly go into service on TWA, United, and Western Air Express.

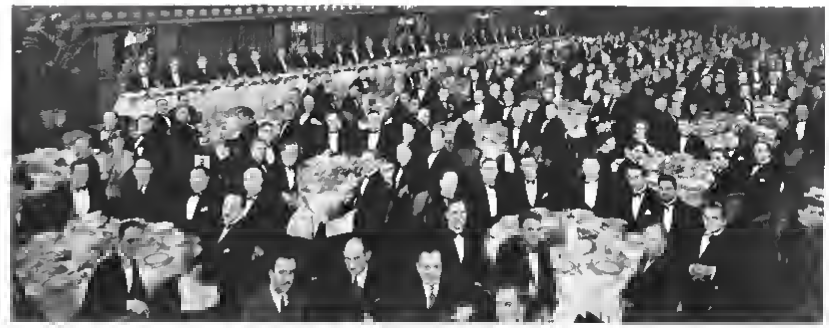
One development influencing the year's traffic figures, and auguring well for the winter, was TWA's reduction in fares which went into effect Nov. 1 as an experiment to increase traffic in the slack months. Too late to influence October figures, results of the first month's operations are nonetheless interesting and perhaps significant. The line showed an increase of 122 per cent in number of passengers carried in November 1936 over November 1935. Passenger miles nearly doubled rising from 3,396,520 to 7,599,957. President Jack Frye, however, was not ready to assign credit entirely to rate reductions admitting that weather was also better this November than last. "But neither do these encouraging figures accurately reflect the results of lowering rates," he said, "because we were unable to accommodate hundreds of passengers. Business indicates that the reduced fares are popular."

Total passengers for the year on all 23 domestic lines came close to 1,000,000, where 1935, the previous best year showed 747,000.

New DC-3 equipment on the lines includes 30 for American (Cyclone-powered), of which 20 are now in service; 28 for United (Twin Wasp-powered) the first of which was delivered last month, eight for TWA (Cyclone powered and with some special modifications) for delivery early this year, two (Twin Wasp-powered) for Western Air Express, for delivery next April, and two (Cyclone-powered) to Eastern Air.

BLACK INK *American Airlines*

appears in airline ledgers when ships go out full and often. An American Airlines DST loads up for a night take-off.



THE INDUSTRY LINES UP

in honor of George W. Lewis who heads up the NACA. On this occasion he was presented the Daniel Guggenheim Medal "for outstanding success in the direction of aeronautical research and for the development of original equipment and methods". The dinner was organized by the Institute of the Aeronautical Sciences with the cooperation of the SAE and the ASME.

Production

U. S. output 68 per cent above last year. Exports up.

BUREAU OF AIR COMMERCE FIGURES for the first nine months of 1936 showed a 68 per cent increase in production of airplanes over the corresponding part of 1935. American manufacturers turned out 2,197 planes of which 1,287 were for domestic civil use, 573 for military service and 337 for export.

Figures released by the State Department showed a sharp increase in the value of equipment purchased in this country by foreign powers. The November total was $3,472,116 as compared with a $1,501,480 total in October. Japan's purchases amounted to $682,000 a 600 per cent gain over the previous month. Russia spent $934,949 for American aircraft as against $125,000 in October.

NAA Convention

Speakers urge air armament, encourage private flying.

PRINCIPAL THEME of the annual convention of the National Aeronautic Association, held at Chicago, Nov. 29 and 30 and Dec. 1, was to urge general recognition of aviation as a popular sport and established industry, integrated into the social and business life of the country. The Board of Governors and the Executive Committee urged establishment of permanent civil aviation committees in both Houses of Congress.

The first formal session, with Col. Lafeton Whitney presiding, opened Nov. 29. Maj. Gen. Oscar Westover, Chief of the Army Air Corps, warned against lack of U. S. preparedness in the air. Saying that in 1935 New York City spent $60,000,000 for law enforcement, he remarked that "This is an ironic contrast to the $50,000,000 expended during 1936 for operation of the Army Air Corps."

Commander C. E. Rosendahl, Commandant of the U. S. Naval Air Station at Lakehurst, N. J., defended lighter than air, both military and commercial, with his usual vigor.

At the association's annual banquet, Dec. 2, posthumous award was made of the gold medal of the Federation Aeronautique Internationale, won by Wiley Post in 1931. It was received in behalf of Mrs. Post by Charles W. Short, Jr., manager of the Tulsa, Okla., airport. F.A.I. medals went also to Major Albert Stevens and Captain Orville Anderson for their record-breaking stratosphere balloon ascension a year ago last November. Toastmaster at the banquet was C. S. "Casey" Jones.

Eugene L. Vidal, director of the Bureau of Air Commerce, presided over a session devoted to "Private and Miscellaneous Flying."

Col. Edgar S. Gorrell, president of the Air Transport Association of America, was principal speaker at the Air Transport luncheon Dec. 1.

WPA Program

Airport expenditures up $15,000,000 in third quarter

THE WPA AIRPORT IMPROVEMENT PROGRAM is over 50 per cent complete, according to a report released by Harry L. Hopkins, administrator. The report covers the period through the third quarter of 1936.

When the last quarterly report was released last June 30 a total of $40,690,290 had been authorized for expenditure. By Sept. 30, this had risen to $56,027,283—74.9 per cent of authorized allocation. The program includes 616 projects located at 446 different sites.

National Show

Industry rallies behind first New York effort in seven years

REPORTS FROM THE MANAGEMENT of the National Aviation Show, which is scheduled for Jan. 28 to Feb. 6 at Grand Central Palace, New York, indicate an encouraging acceptance by the industry of the first aircraft show New York has seen since 1930.

As we go to press, the list of firms having reserve space has grown to 76, from the 40 reported in the November issue. Most extensive representation is in the private owner field, particularly in the light plane division. To date only one airline has signed up.

Support is also coming from the

(Turn to page 49)

(Continued from page 47)

manufacturers of aircraft components, from the Bureau of Air Commerce, the Army and Navy, the Post Office, and a member of other aeronautical organizations. The Bureau will feature its new roadable autogiro. Newark airport will show a typical traffic control tower.

Publicity plans during the show include a mass flight over the city of private planes from nearby fields, and also a display of military tactics by National Guard units.

Transport News

Air express up; Eastern expands; United gets Douglases

TESTIFYING TO THE SUCCESS of the consolidation of air express contract lines in the Air Express Division of Railway Express Agency, the Division has released figures showing that for the nine month period from February through October, there was an increase of 64½ per cent over the combined revenue of the old and new contract lines for the corresponding period in 1935.

October revenue was up 59 per cent over a year ago. A total of 440,000 lb. was carried by the 21 domestic lines holding contracts with the Division.

United equipment — First of UAL's 28 Douglases arrived in Hartford last month for final tests on its Hamilton Standard constant speed propellers. It was the first of the new Douglas series to be fitted with Pratt & Whitney Twin Wasps, of which United has ordered 68. They are 1,000 hp. 1830's, and will give the Douglases a cruising range of 1,500 miles with climb to 10,000 ft. on one engine.

Type division calls for ten 21-passenger day planes, the first of which will go on the San Francisco-Los Angeles run, ten 14-passenger versions, and eight sleepers.

"Southwest beckons"—Through service started Dec. 15 between Houston and New York via New Orleans. It was Eastern Air's inaugural run on the newly acquired Wedell-Williams route between Houston and New Orleans. Said General Manager Rickenbacker: "My only hope is that this expansion will not be the last for Eastern. . . . The whole southwest beckons. I hope we shall be able to heed the beckoning."

Dividends—Pan American President Juan Terry Trippe announced Dec. 11 that a dividend of 60 cents a share would be paid on PAA stock of record Dec. 15. Distribution totaled $411,000. A $150,000 wage increase for pilots, mechanical employees and other flight and ground personnel will go into effect early this year.

Also announced after a trip around the world, was news of completion of negotiations to extend the Pacific route from Manila into Hongkong, where a connection can be made with Imperial Airways. Actual operating base will be at the Portugese island of Macao, 40 miles from Hongkong. Service will start early this year.

Another operations headache for Pan American is the ruling that pilots flying over Brazil must be naturalized citizens or native Brazilians after 1938. A similar Mexican ruling last year caused much annoyance.

Best month for C&S— An increase of 21 per cent in passengers carried on Chicago & Southern Air Lines in November over October has been reported by President Carleton Putnam. This made November the best month in its history. Putnam attributed part of the increase to reduced fares, which became effective Nov. 1.

TWA shuttle—Looking toward a connection with next year's projected trans-Atlantic service from Baltimore, TWA has started one-plane-a-day shuttle service between the Maryland city and Pittsburgh.

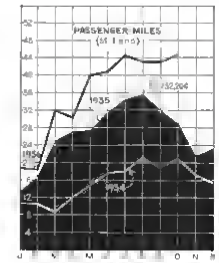
I.C.C. proceedings — Dec. 3 the Interstate Commerce Commission began public hearings in a general investigation of air mail costs and postal revenues from air mail. It will seek to devise a formula for computing anticipated revenues for the ascertainment of payments to contractors. The Air Mail Act of 1934 directs the Commission to "fix and establish rates for each route . . . designed to keep the aggregate cost . . . on and after July 1, 1938 within the limits of the anticipated postal revenue therefrom."

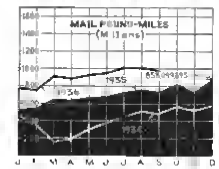
According to Post Office figures, mail revenue increased $3,000,000 for the fiscal year ending last June, the total going to about $9,500,000. This still resulted in a deficit of a

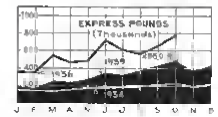
(Turn to page 51)

Traffic

Latest available statistics from the Bureau of Air Commerce and the Post Office Department—Domestic airlines only







AIR TRANSPORT INDICATOR

Dec. 1, 1936

229.7

—which is the ratio of revenue passenger miles for November 1936 as compared with the corresponding figure for November 1935.

For October 1936 the indirator stood at 159.8.

(Continued from page 49)

little over $3,000,000, as the air mail service paid for about 7,500,000 additional miles flown at a cost increase of about three cents a mile over the previous year. It will be the Commission's job to adjust this cost to meet income.

Off-line Service—Another battle over the jurisdiction of the ICC loomed last month after American Airlines had asked that organization for permission to inaugurate off-line service from Detroit to Fort Wayne and Indianapolis and from Detroit to Dayton and Cincinnati. The Post Office Department said that the Commission had no authority to grant such permission.

Industry Notes

British buy American; Greeks to have Fairchilds

Robert E. Gross, president of Lockheed Aircraft Corp., has revealed that in addition to the four Electras, ordered by British Airways (AVIATION for December 1936) his company has received orders from the Polish National Airline, L.O.T., from Industria Aeronautica Romana of Roumania, and Linea Aeropostal Venezelana of Caracas, Venezuela.

The Venezuelan order will be delivered in January, the Polish order in February and the Roumanian order in March. All the planes will be powered with Pratt & Whitney engines.

Security plans—A 9,000 sq. ft. factory at Long Beach, Calif., is under construction for Security National Aircraft Corporation, where the Kinner-powered Security National folding wing plane will be built. According to W. B. Kinner, president of the company, the payroll of the plant will be between 300 and 400 by April 15.

Fairchild Abroad—The first European order for the recently developed 300-hp. Ranger engine has been announced by Sherman M. Fairchild, president of the Fairchild Engine & Airplane Corporation. The order is from Greece and calls for 20 engines and parts at a contract price of $104,000.

Coast Guard Wacos—Waco Aircraft Corporation, Troy, Ohio, has submitted the low bid for construction of from two to six planes for the Coast Guard. Bid prices ranged from $12,250 to $11,500 per plane, depending on the number ordered.

Cub Improvements—Dual Ignition installation of the Continental A-40-4 engines used in Taylor Cubs has been approved by the Bureau of Air Commerce. Use of twin magnetos and accessories on the Cub is optional with the purchaser.

Hammond Base—A 25,000 sq. ft. factory has been opened in South San Francisco for production of the Hammond Y's which have been ordered by the Bureau of Air Commerce. They will be manufactured by the Stearman-Hammond Aircraft Corporation, of which Lloyd Stearman is president. According to the present schedule, ships should be available for delivery soon after the first of March.

Rearwin Representative—Dr. Arthur La Roe has been named Eastern distributor for Rearwin Airplanes, Inc. His headquarters will be in New York. For some years he was New York dealer for the old Eagle Rock. He is a reserve captain in the Army Medical Corps and a qualified flight surgeon.

Norsemen—Bob Noorduyn, of Noorduyn Aircraft, St. Laurent, Quebec, has reported sales of Noorduyn Norsemen to six leading Canadian operators.

The War Department—announced Dec. 4 the purchase of 28 primary training planes and spare parts from the Stearman Aircraft Co. of Wichita, Kan. Contract price is $146,720. It is an expansion of previous orders for the same type totaling about 60 ships. The expansion of the order, according to Secretary Woodring, allows a saving of about $620 for each plane.

Navy Engines—Pratt & Whitney Aircraft Division of United Aircraft Corp., has received an order, announced Dec. 10, for 249 engines for installation in aircraft now under construction. Total price is $2,743,721.

Boeing YB-17 tested—The first of the thirteen Cyclone-powered Boeing bombers, being built for the Army at Seattle, began its acceptance flight tests Dec. 2. First pilot was Major John C. Corkille.

A few days later Captain Stanley M. Umstad was bringing the 16-ton bomber in for a landing—but the brakes were locked. The wheels slid a few paces, then the tail came up and the nose ground into the field. Damage was limited to a crushed nose section and four bent propellers.

Calendar

Jan. 11-15—Annual meeting S.A.E., Detroit, Mich.

Jan. 28-Feb. 6—National Aircraft Show, Grand Central Palace, New York.

March 15-21—Second Annual Pacific Aircraft Show, Pan-Pacific Auditorium, Los Angeles, Cal.

June 28-July 10—Eighth Annual Soaring Meet (International), Elmira, N. Y.

Miami Meet

Evans wins Havana race; Wallace takes two events

For several days prior to the start of the ninth annual Miami all-American air maneuvers, planes, singly and in convoys, were headed south throughout the Eastern seaboard.

In spite of disappointing weather, 3,500 spectators turned out at Miami for an improvised first-day schedule, principally acrobatic and stunt flying. On the second day Mike Murphy, of Kokomo, Ind. won a Taylor Cub race at 85.49 m.p.h. The $350 first prize and the $2,000 Argentine Trophy went to Dewane L. Wallace of Wichita.

A race from Miami to Havana by way of Key West was won by Roy S. Evans of Miami. The same day a new amphibian record for the New York-Miami run was set by Major Alexander P. de Seversky. He made the run in five hours 46½ minutes in one of his own amphibians.

Contract Woes

Walsh-Healey law results in dearth of government bids

The Walsh-Healey act passed by last Spring's Congress, stipulating NRA labor conditions in the fulfillment of government contracts, is proving a boomerang to the various government procurement divisions.

As the law is written, contracts under $10,000 are exempt. Contracts above $10,000 are subject to reg-

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(*Continued from page 51*)

ulations laid down by the Secretary of Labor in their labor aspects.

Some recent Navy bids for copper and other metals have been returned blank, prospective bidders preferring no contract at all to the effort of fulfilling a contract under Walsh-Healey provisions. Secretary of Labor Perkins has denied an application for exemption of contracts for purchases of airplanes and aircraft materials from provisions of the law. Contemplated amendments would eliminate exemptions.

K. L. M. Crash

Cierva dies with 14 in London tragedy. W.A.E. plane missing

FIFTEEN PEOPLE LOST THEIR LIVES in the crash of an Amsterdam-bound K.L.M. Douglas at Croydon Aerodrome, London, Dec. 9. It was the worst crash ever recorded in Great Britain. One of the victims was Juan de la Cierva, Spanish inventor of the autogiro.

W.A.E. plane missing. After ten years of operation with no passenger fatalities, fate caught up with Western Air Express Dec. 15. On Dec. 14 eastbound Trip 6 left Los Angeles at 11:15 p.m. and was scheduled to arrive in Salt Lake City at 4:10 a.m. the next day. Aboard was a crew of three, F. J. Samson, pilot, Co-pilot Wilham Bogan and Stewardess Gladys Witt, and four passengers.

Last report heard from the plane was at 3:27 a.m. when it was over Milford, Utah.

Intercity Record

Klein flies Canadian Grumman 715 miles in 3 hr. 15 min.

IN A FLIGHT sponsored by the Canadian Car & Foundry Co., Montreal, Canadian licensees for the Grumman FFE two-seater fighter, Howard F. Klein rocketed one of the Cyclone-powered ships from Roosevelt Field on Long Island to St. Hubert Field, Montreal, in one hour 40 minutes. He left Roosevelt on Dec. 13 and beat a one hour 57 minutes record set in 1931 by Frank Hawks.

The return trip, made Dec. 15, took only one hour 30 minutes giving Klein a flying time for the 715 miles of three hours fifteen minutes.

News in 1936

Highlights of the News Year as reported in AVIATION

(For details see issue of month indicated)

DOMESTIC TRANSPORT. Twenty-two lines consolidated their express business under Railway Express Agency (Feb.). Five major lines, American, Eastern, Pan American, TWA, and United announced plans for joint development of a "standard" transport plane—the Douglas DC-4 (Feb.). Airlines quit Aeronautical Chamber, set up own organization, the Air Transport Association (Feb.). Domestic lines order 70 Douglas DC-3s (Jan. et seq.). United experiments with radio blind landing system tied in with the automatic pilot (June). Bureau of Air Commerce establishes airways traffic control system, sets up 73 routes as Civil Airways, limits intentional instrument flying in bad weather (Aug.). TWA experiments with aerial freight (Aug.). TWA promises high altitude flying in two years (Nov.). TWA, Chicago & Southern and Braniff reduce fares (Dec.). TWA denied Albuquerque-San Francisco extension by ICC (Nov.). Eastern Air buys Wedell-Williams (Dec.). Pennsylvania Airlines and Central Airlines consolidate (Dec.). Post Office settles $9,000,000 worth of claims for $600,000 on mail cancellation suits brought by AA, TWA, NWA and WAE (July).

WORLD TRANSPORT. U.S.-German and U.S.-French pacts concluded for 1936 experimental North Atlantic flights. Lufthansa made eight experimental crossings with catapault-launched diesel-powered flying boats (Mar., et seq.). German Zeppelin Hindenburg makes ten scheduled trips between Germany and U.S. (June, et seq.). PAA-Imperial plans New York-Bermuda service for 1937 (Aug.). Pan American-Grace speeds up South American schedules (Aug.). Pan American starts passenger service across the Pacific (Nov.).

ARMY AND NAVY. Army orders 80 Seversky, Curtiss pursuits (July, Sept.); unannounced number Curtiss attacks (Aug.), 3 Lockheed transports (Aug.), 225 Stearman, North American trainers (Aug., Dec., Jan., '37), 120 North American observation (Dec.), 662 Wright engines (April, Aug.). Navy orders 114 Douglas torpedo bombers (Feb.), 40 Curtiss scout observation (June), 83 Curtiss scout bombers (July), 108 Curtiss, Northrop dive bombers (July), 116 Consolidated patrol bombers (Aug., Dec.), 249 P&W engines (Jan., '37). Durand Committee, appointed by National Science Advisory Board, recommends resumption of Navy's airship program (Mar.). Capt. Arthur B. Cook takes the helm as Chief of the Navy Bureau of Aeronautics (June).

CONGRESS. Copeland Committee on Safety in Air reports on Cutting crash; criticizes sharply Bureau of Air Commerce (July). Bill passed authorizing increase in Air Corps strength to 4,000 planes in next five years (July). Airline pilots placed under Railway Labor Act (July).

RECORDS, RACES. Howard Hughes sets new transcontinental and New York-Miami records (Feb.). Douglas Amphibian breaks two FAI records in 1,425 mile Army San Juan-Langley Field flight (Aug.). Italians claim eight seaplane speed-load-distance records (Aug.). Greve and Thompson Trophy races at Los Angeles won by Michel Detroyat. Bendix Trophy won by Louise Thaden (Oct.). Harry Richman, Dick Merrill, Mrs. Beryl Markham, James Mollison fly the Atlantic (Oct.). Sikorsky S-43 amphibian breaks four altitude marks (May). British set new world airplane altitude mark of 49,967 ft. (Nov.).

Schools, Services, and Airports

A state-by-state tour of the flying fields

» ALABAMA—Hangars are being built at TUSCALOOSA BREWTON, CLANTON, MONROEVILLE, and MONTEVALLO. The one at ANNISTON is to be finished, and several others are contemplated in projects now operating.

» CALIFORNIA — Dale Hunter northern California distributor for Porterfield planes, reports the sale of one of the little ships to W. F. Harbaugh, of SACRAMENTO. . . . Tex Hudson heads the newly formed SACRAMENTO Flying Club. . . . The LONG BEACH city aviation commission has taken action to acquire 350 acres of additional land at the airport. . . . A $162,000 WPA project will provide two 100x100 ft. hangars, an administration building and two runways at the STOCKTON Municipal Airport. . . . About 25,000 spectators gathered for the air show which dedicated the MODESTO Municipal Airport. Sixty-six planes were present. . . . Floyd K. Wright has leased the SANTA ANA Airport for a ten-year period. . . . An airport has been opened by Lee Fullerton at POMONA.

» CONNECTICUT—Richard Markey was re-elected president of the NEW LONDON Aviation Club at its annual meeting late in October. Other officers elected were: Albert Nichols, vice-president and secretary, Joseph Bojorquez, treasurer; David Main assistant treasurer; and John Granfield, publicity director. . . . A WPA project will provide for construction of two runways at Brainard Field, HARTFORD. They will be 3,100 ft. and 3,500 ft. long. A $94,719 project for construction of a new administration building was approved late in November.

» DISTRICT OF COLUMBIA—Samuel J. Solomon, manager of WASHINGTON Airport, announced completion of a project providing two paved runways, 4,200 ft. long and 3,000 ft. long taxi strips, hangar aprons, and a loading apron.

O. J. WHITNEY

takes delivery from T. Claude Ryan of his first Ryan S-T-A at Ryan Aeronautical. Whitney is Ryan distributor for New York and New England.

» FLORIDA—The TAMPA chapter of the National Aeronautic Association has approved the recommendation of one of its committees that the city set up a special aviation department. . . . Lloyd Fales, president of the Viking Airport, Inc., MIAMI, has requested the first available hangar space at Miami municipal Airport.

» GEORGIA—Lane Air Service, based at ALBANY Municipal Airport, and which was organized in 1933 by Harmon Lane, is now operating two ships and expects to take delivery on a third this fall. . . . BIBB COUNTY commissioners have agreed to purchase 100 acres of land from the city of MACON for $7,500 to help the city raise the necessary $8,500 for completion of the municipal field.

» IDAHO—Title to the last 160 acres of land required to complete the 960 acre tract for the new BOISE Municipal Airport is rapidly being obtained. The property is being acquired through options submitted by the owners quoting a price of $10 an acre.

» ILLINOIS—Quad City Airmen's Association, MOLINE, early in November voted to change its by-laws to provide for a board of nine elected directors, made necessary because of the growth of the club, which now numbers 70. . . . The recently organized National Aeronautic Association chapter at QUINCY has about 60 members and has purchased a Taylor Cub.

» INDIANA—Roland Koontz has purchased a new Taylor Cub and Herbert Bucklin has purchased a new Stinson, which are based at SOUTH BEND Municipal Airport. . . . The TERRE HAUTE board of aviation commissioners has named O. W. Jones superintendent.

of the Paul Cox Municipal Airport . . . Presidential approval has been given to a $667,000 WPA improvement project at the new Bendix Municipal Airport, SOUTH BEND

» IOWA—Runways at IOWA CITY Municipal Airport are being covered with crushed rock, and one of them is being extended from 2,500 to 3,500 ft. in length. Next spring the crushed rock will be covered with asphalt.

» KANSAS—LAWRENCE city officials are considering establishment of a $125,000 airport. . . . Although estimated receipts at the WICHITA Municipal Airport for 1936 were estimated at only $24,400 actual receipts through the first nine months of the year totaled $25,642

» LOUISIANA—E. E. Elam, manager of Shushan Airport, NEW ORLEANS, is drawing up plans for construction of a seaplane breakwater in the lake. The plans will be submitted to the Bureau of Air Commerce for approval. Estimated cost is $1,000,000

» MAINE—The Department of Labor has announced that CARIBOU Airport has been designated as a permanent port of entry. The radio beacon serving AUGUSTA Airport from Granite Hill was scheduled to go into service late in November. Similar beacons at BANGOR and PORTLAND Airports are nearing completion. . . . Recently elected officers of the PORTLAND Aviation Club are: Herbert Myers, president; Paul Thorndike, vice-president; Olive Fogg, secretary, and Bradford Adams, treasurer

» MARYLAND—Dana and Millard Tawes have purchased a new Taylor Cub, which they will base at Lavalette Point Airport, CRISFIELD. . . . Filling of bulkheads at the BALTIMORE Municipal Airport was scheduled to get under way early in November. Plans call for a total of 3,600,000 cu. yd. of fill

» MASSACHUSETTS — The FRAMINGHAM Air Service, directed by Gordon Cameron, operators of the Framingham Airport, have purchased two Cubs. . . . The town of CANTON has voted to purchase the runways on the Boston Metropolitan Airport in Canton from the airport corporation and will lengthen and improve the present runways with funds furnished by WPA. . . . Joseph Garside, manager of E. W. Wiggins Airways, operators at the Boston Metropolitan Airport in CANTON, report the recent sale of five planes, four Taylor Cubs and one Aeronca. . . . Mike Harlow, is flying with Inter City Airlines

» MICHIGAN — WPA improvement projects at REXTON and HESSEL call for the installation of concrete runway circles and boundary markers. . . . The $40,000 WPA runway project at BATTLE CREEK Airport was scheduled for completion Nov. 15. . . . The radio station at the Capital City Airport, LANSING, has been put on a 24-hour-a-day basis. The regular operator will be William Meadowcroft, who will be assisted by Tony Winters. . . . The WPA has granted $6,035 for grading two runways and installation of a concrete field circle, boundary markers and signs at the MANISTEE Municipal Airport.

» MISSISSIPPI—Closure of the Jackson Airport has been threatened unless the city can get immediate action on the proposed $480,153 WPA airport project. So far the field has received $58,000 from the WPA. . . . An air show and Armistice Day celebration was staged at the NEWTON Airport Nov. 11

» MISSOURI—The ST. LOUIS Flying Service has sold new Fairchild 24 ships to the following: Paul Pierson, Terre Haute, Ind., and Truman T. Metzel of Chicago, Ill. . . . A bill for the creation of a bi-partisan Missouri Aeronautics Commission to regulate flying within the state has been drafted by a sub committee of the ST. LOUIS Chamber of Commerce Air Board. A 22-ft. electrically lighted wind indicator has been installed on the roof of the administration building of the LAMBERT-ST. LOUIS Field, St. Louis. . . . KANSAS CITY voters Nov. 3 approved a million dollar bond issue for extensive improvements to the municipal airport, including enlargement of present runways and surfacing them with reinforced concrete, enlargement of passenger station facilities, revision and improvement of the field light system and installation of a radio landing beam

» MONTANA—A WPA project will grade the field and bury power cables at the GREAT FALLS Municipal Airport.

» NEBRASKA—W. J. Hotz of OMAHA, has been elected chairman of the Nebraska Aeronautics Commission for a six-months term. He succeeds Dr. W. A. Arrasmith of GRAND ISLAND. . . . Work has started on the installation of a new lighting system at the OMAHA Municipal Airport. The cost will be between $25,000 and $30,000 and it is a WPA project

» NEVADA—A new airplane hangar is being constructed by the WPA at the ELY Airport. It includes a 20-ft. concrete apron in front and office space within

» NEW HAMPSHIRE — The NASHUA Board of Aldermen has voted in favor of a $100,000 bond issue to supply the sponsor's share in a number of municipal WPA projects. $20,000 of the issue was for the municipal airport

» NEW JERSEY—Plans are being made for formation of a Hadley Field, NEW BRUNSWICK, chapter of the National Aeronautic Association. Those organizing the group are Robert N. Buck of WESTFIELD, Robert Jaeckel, of PLAINFIELD, Raymond J. Zilch of HIGHLAND PARK and Leslie Cramer of NEW BRUNSWICK. . . . Late in November the RED BANK Airport, which is operated by John F. Casey as the Airview Flying Service celebrated its tenth anniversary

» NEW MEXICO—Necessary land for a municipal airport at ALBUQUERQUE is under option to the city and a WPA project for its improvement is expected to get underway shortly. $850,000 will be spent on the project of which $100,000 is to be put up by TWA as sponsor's share. The airline will then lease the field for a twenty-year period.

» NEW YORK—M. F. Steffen reports that there are 45 men (pilots and students) flying from his hangar at BUFFALO Airport at the present time. . . . The ROCHESTER City Council is considering a $288,000 improvement project at Rochester Airport. . . . The GLENS FALLS Common Council has authorized construction of a steel hangar instead of a wooden hangar at the Airport.

(*Turn to page 59*)

Pan American Clipper above San Francisco Bay. (In California 237 Boeing School graduates have secured positions with liner and factories.)

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» NORTH CAROLINA — Johnny Terrill, who operates the Terrill Flying Service at LENOIR, has purchased a new Waco cabin through Reavis Nelson of the Cannon Nelson Aircraft Corporation of CHARLOTTE. . . . Early in November bids were asked for the complete lighting of the GREENSBORO-HIGH POINT Airport. The Greensboro City Council has relinquished its lease on the field, turning it over to the county for administration. . . . The Seaboard Flying Service began operations Nov. 1 at the ELIZABETH CITY Municipal Airport. Manager of the service is A. C. Stration. J. D. Driskill is in charge of flying.

» OHIO—Rapid moves to enlarge Transcontinental Airport, TOLEDO, to accommodate planes in coast to coast service, are being made by the city. The city has voted to purchase the airport for $65,000, from a private company of citizens who developed the 535 acre tract in 1931. $5,000 is being sought by city officials for installation of lights at the DAYTON Municipal Airport at VANDALIA.

» OKLAHOMA—Oklahoma's first air pilot's association was formed at TULSA on Nov. 21 at a meeting of more than 100 aircraft operators from over the State. It will be known as the Oklahoma Chapter of the National Aeronautic Association. Duncan A. McIntyre, was unanimously elected governor, Cleo W. Clifford was elected secretary-treasurer. Clifford is the present secretary of the N. A. A. Tulsa Chapter.

» OREGON—The second Northwest Aviation Planning Council was scheduled to meet in PORTLAND Dec. 4 and 5 with James Ford, manager of the SPOKANE Chamber of Commerce, presiding, and Harry K. Coffey, governor in Oregon for the National Aeronautic Association and president of the PORTLAND Aero Club as vice-chairman and chairman of the program committee. . . . 18 aviation enthusiasts met at the SPRINGFIELD Airport early in November and formed a Springfield chapter of the Oregon Private Flyers' Association. The group is headed by M. R. Timmerman as president and Art Severson as secretary.

» PENNSYLVANIA—More than 90 men are at work on an airport improvement project at WAYNESBORO. The north-south runway, taxi strip and apron have been macadamized and are nearly complete.

» WISCONSIN—The WPA has allotted a second appropriation of $159,000 for improvements at the MILWAUKEE County Airport. Total thus far allocated is $318,000. . . . Howard Morey, manager of the Royal Airport, MADISON, has been elected vice-governor of the Wisconsin chapter of the N.A.A. HARRISBURG's million dollar airport improvement project is scheduled for completion next June 1.

» SOUTH CAROLINA—Improvements at the Woodward Airport at CAMDEN include mowing the field and painting the hangar. . . . William N. Craig, of the Hawthorne Flying Service, CHARLESTON, recently purchased a new Taylor Cub.

» SOUTH DAKOTA—It is expected that work on the new administration building at the HURON Airport will be completed by Jan. 1. The building is made of cut stone, two stories high and measured 32x53 ft.

» TENNESSEE—Air Service & Sales, Inc., CHATTANOOGA, has sold a new Taylor Cub to the Cleveland Flying Club. . . . The new municipal airport on Murfreesboro Road, NASHVILLE, was dedicated before a crowd of more than 40,000 people Nov. 2.

» TEXAS—Concluding without a mishap a Texas aerial tour of nearly 1,000 miles, a good-will flight of eighteen planes broke up at SAN ANTONIO Nov. 15.

» UTAH—The first shovelful of earth on SALT LAKE CITY's $1,072,000 WPA airport improvement project was turned by Governor Blood late in October. Of the total cost the city will contribute $222,000, largely in materials and supervision and the county will supply $75,000.

» VIRGINIA—In November a drainage system for the runways at Preston Glenn Airport, LYNCHBURG, was completed. The project cost $1,200, the money having been appropriated by the city council. . . . Two of the three runways at the central airport at Holston Institute, which will serve, BRISTOL, JOHNSON CITY and KINGSPORT, were completed in November, at which time 80 per cent of the grading work was finished. The field is a $600,000 WPA project.

» WASHINGTON—The lease held by James Leachman on the WALLA WALLA Municipal Airport has been extended to Sept. 30, 1938. Leachman has managed the field for the past year. Under terms of the lease all operating revenues will go to him. The city pays $48 a year for operation of the beacon and border lights.

» WYOMING—By late November a $40,000 WPA project to oil runways at the Wardwell Airport, CASPER, was nearly completed.

Schools

» The BOEING SCHOOL OF AERONAUTICS, Oakland (Cal.) is developing practical air transport and aeronautical engineering courses designed to qualify students for engineering jobs in aircraft operations and manufacture. Combining practical and technical training, the new courses are being shaped along lines developed by conferences with outstanding engineers in leading companies in the field of aircraft operation and construction. The course will be of 24 months' duration, with an admission requirement of two years of pre-engineering at an accredited college or university. The aeronautical engineering course will include practical training covering construction of plancs and component parts, building, repair, maintenance and installation of radio and instrument equipment, and the overhaul and installation of engines used in training and transport planes.

» PARK AIR COLLEGE, East St. Louis, (Ill.) has inaugurated an air communication course for post-graduate students and airline men. The course qualifies the students to take the Federal communication examination for radio telegraph operators, third class license, and radiophone operators, second class license. Charles J. Schwarz, associate professor of radio, is in charge.

» Following established custom, the RYAN SCHOOL OF AERONAUTICS, Lindbergh Field, San Diego (Cal.) was host on the night of Oct. 30 to more than 100 couples at its annual student Hallowe'en party and dance.

Aviation People

Who's who and what they are doing

Juan de la Cierva

Ernest W. Dichman

Howard S Welch

Orval M Mosier

W D Guthrie

» The aeronautical world can ill afford the loss of Juan de la Cierva, who died in an airplane accident near Croydon Airdrome, England, on Dec. 9. The term "autogiro" can never be dissociated from the name of its inventor, Cierva, whose life work in the development of safety in aircraft led to the first practical rotating wing machine in 1924. From then until 1933 he continued his experiments until he had stripped his original model of wings, elevator, struts, and rudder, and at the time of his death was working on the elimination of the propeller. In 1929 Harold F Pitcairn purchased the Cierva basic patents and formed the Autogiro Company of America. Cierva acted as consultant, making yearly visits to the United States from 1929 to 1933. This company functioned as a holding company, licensing the patents to Kellett Autogiro Company, Pitcairn Autogiro Company, and Buhl Autogiro Company. Thus all autogiros manufactured in America have their origin in the Cierva patents. Mr. Cierva was born in Madrid in 1896 and was graduated as engineer from the Special Technical College of Madrid in 1919. He was technical engineer for Cierva Autogiro Co., Ltd. of England. Recognition of his contribution to aviation came in the form of the F.A.I.'s second prize in 1926 and its gold medal in 1932, an honorary degree conferred by Stevens Institute of Technology, the Daniel Guggenheim gold medal, the Cresson Medal of the Franklin Institute of Philadelphia, the John Scott Medal, and the Collier Aviation Prize for 1931. Mr. Cierva was a member of the Consejo Superior Aeronautica, the Junta Superior de Estudios y Pensiones para Extranjero, Association of Spanish Civil Engineers, the Association of Aeronautical Engineers of Spain. Associate Fellow of the Royal Aeronautical Society, Honorary Member of the A.I.D.A. of Italy, member of the Societe Francaise de Locomotion Aerienne, of the British, German, French, Spanish and Belgian Aero Clubs, Chevalier of the Legion of Honor and the Order of Leopold, and held the Cross of Alfonso XII.

» At Roosevelt Field, L. I., the new year brought with it a new president, W. D. Guthrie, to succeed George W. Orr, who resigned to become vice-president of Vick Chemical Company. Mr. Guthrie became connected with the operation in 1929, in the accounting department and was made successively assistant treasurer, treasurer, a member of the Board of Directors, operations manager, and during the past year vice-president in addition to his office as treasurer. Mr. Orr served as Governor for New York State for the N.A.A., is permanent chairman of the New York State Aviation Association, and a member of the Institute of the Aeronautical Sciences and the Board of Governors of the Aeronautical Chamber of Commerce.

» Ernest W. Dichman has been appointed sales and service manager of the Chance Vought Aircraft division of United Aircraft, succeeding the late Robert Witbeck. Mr. Dichman received flight training with the Army Air Corps during the war, and on returning to the United States served for ten years with the engineering division at McCook Field. In 1929 he joined Fairchild Aviation Corporation as chief engineer, since 1932 has been consulting engineer with Chance Vought.

» To care for its rapidly expanding export market, Bendix Aviation Corporation has placed Howard S. Welch at the head of its export organization, with responsibility for foreign sales of its automotive, aviation, marine and industrial products. Mr. Welch was formerly president of Studebaker-Pierce Arrow Export Corporation, and since 1935 chief of the Automotive and Aeronautic division of the Department of Commerce. His headquarters will be in New York.

» Orval M. Mosier has resigned as city manager of Oklahoma City

to take charge of public relations and general business promotion for Braniff Airways, Inc., particularly in connection with the proposed extension to Mexico City

» The recently formed Pennsylvania-Central Airlines Corporation has installed the following personnel. W. S. ROSENBERGER, operations manager, with W. R. MANCHESTER, LUTHER HARRIS and R. W. COULTER as assistants; D. A. DUFF, director of sales and advertising, M. C. BENNEY, manager of passenger service; J. J. O'DONOVAN, eastern region traffic manager, HOWARD E. KENNEDY, western region manager; R. L. BAKER, chief pilot.

» JOHN W. POOLE has opened offices at 369 Lexington Avenue, New York City, as consultant to manufacturers and users of lubricants. Mr. Poole is a graduate of M.I.T. and served on its staff for four years.

» In recognition of his record as general traffic manager since joining Western Air Express last spring, THOMAS WOLFE has been promoted to vice-president in charge of traffic. Mr. Wolfe had formerly been district traffic manager for United Air Lines in Chicago.

» Two new directors have been added to the board of Transcontinental & Western Air: PAUL E. RICHTER, vice-president in charge of operations, and HOWELL VAN GERBIG, financier and pilot. Mr. Richter has been active in air transport since 1926. In 1934 he succeeded Jack Frye as TWA operating vice-president.

» At the recent convention of the Airline Pilots Association, DAVID L. BEHNCKE was re-elected president. Following officers were elected: L. W. HARRIS, secretary; C. T. ROBERTSON, treasurer; T. O. HARDIN, 1st vice-president; vice-presidents, C. H. DOLSON, A. D. DURST, WALTER ERFSEN, R. T. ELSMORE, M. B. FREEBURG, F. W. KELLY, F. B. KERN, E. J. MARTIN, JACK O'BRIEN, V. I. POWERS, S. E. ROBBINS, W. B. SMITH, S. J. WILLIAMSON.

» Pan American's president and general manager, JUAN T. TRIPPE, has been elected a director of the Chrysler Corporation.

The Navy in 1936

(Continued from page 23)

cident with the advancement of the flying units must come the provision for proper upkeep facilities, not only to meet the needs of the moment and immediate future but so designed as to form the nucleus for rapid and efficient expansion in the event of a national emergency. The Navy has made a most creditable showing in the face of existing handicaps during the past year by overhauling 544 airplanes and 1,135 engines, which is an increase of 12 per cent in aircraft and 45 per cent in engines over the number overhauled during the fiscal year 1935. Additionally, an increase was made possible in the number of flying hours between routine overhauls for both airplanes and engines.

In connection with the necessary distribution of air-craft for overhaul and for the delivery of new aircraft, the Navy has continued its policy of ferrying planes between the west and east coasts. Last year a total of 492 transcontinental flights were made in naval aircraft, by naval pilots.

The materials entering into the construction of naval aircraft are subjected to severe operating conditions. The field is a constant battle ground, the scene of a continuous struggle to improve in lightness, strength, resistance to wear, to fatigue and to corrosion.

THE expansion of Naval Aviation, as authorized in the Vinson-Trammell Treaty Navy Bill of 1934, made necessary the immediate acquisition of additional shore facilities. Accordingly, on Oct. 26, 1935, a Presidential Executive Order directed the transfer of Rockwell Field, San Diego, Luke Field, Pearl Harbor, Old Bolling Field, Anacostia, D. C., from the custody of the War Department to the Navy Department and the Naval Air Station, Sunnyvale, California, from the custody of the Navy Department to that of the War Department. With the partial exception of Rockwell Field, the Army is continuing its occupancy until such times as facilities elsewhere can be developed for their activities now based at these places.

In accordance with the stipulations of the Vinson-Trammell Bill that not less than 10 per cent of all Naval air craft and engines must be manufactured at Government plants, an order for 85 training planes based on the experimental XN3N-1 airplane, built at the Naval Aircraft Factory, and their engines, is under way. Deliveries of these products commenced in June, 1936. The expansion of the factory necessary to manufacture these required aircraft and engines has been accomplished, through the allocation of $2,708,000.

In order that the training program for the additional necessary number of Naval aviators should not be handicapped, development plans were drawn up and approved for the Naval Air Station, Pensacola, Florida. These plans provide for the expansion and modernization of the station by the replacement of old facilities and provision for a number of new ones.

THE large increase in aviation training at Pensacola was brought about primarily through the initiation of training of Naval cadets to meet temporarily the shortage of Naval aviators. During the fiscal year 1936, 494 civilians were appointed aviation cadets and ordered to Pensacola for flight training. These cadets upon completion of their course, are being ordered to the operating squadrons of the Fleet and to the Marine Corps for three years active duty.

In addition to the formation of two new patrol squadrons and supplying them with aircraft, steps have been taken to effect procurement of planes for the aircraft carriers Yorktown and Enterprise and six new cruisers. Further, actual delivery has been effected, to the Service, of 370 airplanes and 468 engines incorporating advanced performance.

As already pointed out, aircraft are being procured as new squadrons are formed and new surface ships completed. On June 30, 1936, there were on hand 977 service and 244 obsolescent aircraft in the Navy. It has been estimated that by the year 1942, when the present building program will have been completed, the Navy will have on hand approximately 1,910 airplanes. These airplanes will be procured through the medium of an orderly and continuous building program, this method having been found to best meet the requirements of the Naval Service.

The Army in 1936

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tions have been provided for the operations of the navigator, radio operator, gunners, and bomber, as well as for the crew off duty. With all of these facilities, the airplane can, in addition, carry its full load of fuel and bombs.

Weather conditions have ceased to have the deterring effect upon air work which they had in the past. With the blind flying and navigational instruments in airplanes, and the special training being given to air personnel, it is now possible for airplanes to take off in weather heretofore considered impossible. With the extensive flying range of new bombers, the mere matter of two or three hours blind flying has little if any, influence upon the airplane reaching its ultimate objective. This has been borne out in numerous instances. For instance, the personnal flying the Clipper ship from San Francisco to Honolulu have deliberately flown off their course in order to strike bad weather so as to determine its effect upon accuracy of navigation and the ability of the crew to carry on in spite of such obstacles. A short time ago a crew of the 19th Bombardment Group from Rockwell Field took off from that place, with a 300-ft. ceiling, climbed up through the fog, reached an altitude of about 1,200 ft. in the clear, flew above the clouds to the gunnery range at Muroc, about 175 miles away. They came into good weather over the desert, and dropped their bombs on the targets. They then returned to San Diego by using the radio beam, dropped down through the clouds and made a successful landing at their home station. In the future such operations will be the rule rather than the exception. Therefore in order to provide proper aerial defense we must plan on using the instruments we have to the limit of their capabilities. In other words, extended flights will be the rule rather than the exception.

WITH MAIN AND ADVANCED AIR BASES established at various points along our coasts and in our territorial possessions the long-range reconnaissance bombing planes can take off with the maximum amount of fuel with reasonable assurance that they will accomplish their mission in National Defense.

Thus far only the capabilities and limitations of our own personnel and equipment have been considered. There is no reason to believe that other nations do not have now, or will not have in the near future, planes of equal performance. Possessing the equipment, it can be expected that the training of their personnel in its use will be equal to ours. It therefore behooves us to take the necessary defensive measures.

A study of the aerial defense of our coastal frontiers indicates that with planes now in existence in the services, operating under such conditions as imposed by the provisions of plans already formulated in "Joint Action of the Army and Navy," which plans include those for the operation of both Army and Navy aircraft in any emergency involving both, it is possible to make the necessary reconnaissance flights and still carry a considerable reserve fuel supply as a factor of safety. Reconnaissance planes making frequent flights over strategic areas would certainly provide a threat to any enemy force approaching our frontiers by land or sea would make it possible to observe their movements and make those forces operate with great caution.

THE AERIAL DEFENSE of our coastal frontiers necessitates certain strategically located air bases. Some of these installations have already been established but many remain to be established. With these bases and in view of the fact that it has been demonstrated many times in the past that air concentrations are now matters of hours rather than days, we could be reasonably assured of an effective aerial defense.

Pursuit has now lost its marked superiority in speed and with the wide variety of targets available to long range bombardment, it is out of the question to expect that pursuit can be so placed as to intercept all air raids. The number of pursuit airplanes required to perform that mission would be staggering.

A study of the aerial defense of our eastern frontier indicates that if certain air bases were occupied or seized and occupied by an enemy force, possessing air equipment as outlined above our entire industrial area with thousands of profitable targets, as well as the Panama Canal so essential to the maneuvering of our Fleet, would be vulnerable to aerial attack.

The solution of the problem lies in providing an Air Force possessing equipment which has now been developed, under such leadership and methods as dictated by the provisions of "Joint Action of the Army and Navy," capable of striking any aggressor approaching our frontiers on his air bases and attacking with aerial bombs his aircraft carriers, troop transports and battleships.

When the subject of hitting the enemy is mentioned there is immediately brought to mind, first, the matter of training personnel in reconnaissance, in order to find the hostile targets, and secondly, training in the accurate dropping of bombs.

IT IS ESSENTIAL to our defense plans to have air units so well trained that regardless of the weather or the character of the ground or water over which they work, they must be able to accurately locate their objectives and then drop their bombs to make hits. This then necessitates that reconnaissance units be so well trained that they can navigate over water and land with equal effectiveness and be able to locate their positions at all times so accurately that the supporting attacking aircraft, coming from a distance, will have little or no trouble in finding and identifying the target. Similarly the bombers must be able to take off in any kind of weather, with a load of bombs, direct their airplanes to a previously designated location, or to a point to which the target has moved and be able in spite of cold, fatigue, excessive strain, or bad weather to release their bombs so as to hit the objective.

Having been provided with the proper equipment there are then two fundamental objectives of training which must be attained. First, ability to find the target, and second, having found it, to hit it. The results attained by the air forces of the principal foreign powers, as well as by our own Army aviation, in various exercises, both while acting alone and while acting in cooperation with the Navy, have shown that these results have been attained and that an air force is today one of the principal means of insuring the successful defense of a nation.

Engine Design

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The improvement in cowling and baffling of radial engines, which has been continuous for several years, has continued, thanks to the efforts of the NACA and of several of the airplane and engine manufacturers. The drag chargeable to cooling in the case of the best air-cooled radial installations is almost unbelievably small and is reported to entail power consumption as low as 1½ per cent of the engine output. The nose-slot cowling, announced by the NACA last spring, seems to have possibilities of still further improving the cooling of radial engines.

A very important 1936 development has been that of "non-icing" carburetors for the large radial engines. The Chandler Groves carburetor is designed with a special type of venturi throttle upon which ice will not collect, while the Bendix-Stromberg type relies on heating of the throttle and carburetor casing, with alcohol injection for use when extremely severe icing conditions are encountered.

In the Diesel field, the announcement by Luft-Hansa that all future transport planes of this company would be powered with Junkers "Jumo" engines is indeed a significant aeronautical event. The regular south-Atlantic flights of Dornier seaplanes powered with "Jumo" 5's not to mention the recent visit of two of these machines to New York and Boston, shows conclusively that the Diesel engine has definitely arrived as a service type for long range airplanes. The fact that the Junkers is the only type of airplane Diesel in wide use at the present time is significant and indicates the difficulty of developing this type of power plant to a point where it can compete successfully with the spark ignition engine. A number of developments of large compression-ignition engines in this country still remain in the highly experimental stage.

Likewise in the experimental stage are the various projects for developing ultra high speed airplane engines with a large number of small cylinders. Although a number of such engines have been under development for several years none seems to have reached the stage where it is ready for extensive service trials. No new liquid cooled engines have passed into the service stage during the course of the year, and the production of the one liquid-cooled service type, the Wright "Conqueror", has declined in relation to the total production of American aircraft engines. Evidently the liquid cooled power plants at present available for service use in this country, do not meet the problems of airplane propulsion as well as do the best air-cooled power plants.

In the field of research, engineers are watching with interest the continued careful and thorough study of cooling and cowling by the NACA, and particularly the projects centered around the cooling of in-line engines. Two-cycle experiments by the NACA and other laboratories are also of considerable interest, as is the continued research in the field of the compression-ignition engine.

The year 1936 has witnessed a concerted effort on the part of a number of agencies toward a more complete understanding of engine vibration and of the factors necessary to isolate it from the airplane structure. The flexible mounting developed at Wright Field, and the instruments for studying vibration developed at the Massachusetts Institute of Technology deserve special mention. The MIT vibration-recording apparatus, with 'pick-up" units for both torsional and linear vibration, is being used to study crankshaft, engine mount and propeller vibration in several important laboratories.

Airplane Design

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in that direction though a slow one, for whereas monoplane wings of 1930 seldom ran to above 6.5 in aspect ratio, 8.2 is now quite common and even 9 is not unknown. The increase of cantilevered span naturally tends to an increase of wing weight, and makes it more important than ever to use the most economical structure. The consequence appears in increase of taper ratio, as far as the designer dares to go without expecting to run into initial stalling at the wing tips and bad lateral control. Taper ratios of 2.5 or more have become common and there is a constant and eager search for means whereby they can be increased still farther without introducing new mechanical complications or increasing the icing hazard, as it is likely to be increased by anything of the order of a slot.

FOR MILITARY AIRPLANES, higher altitudes require the use of oxygen by the crew, but for transport work they will require more than that, and the stratospheric airplane is gradually moving from the stage of speculation to that of actual trial. How far the advantages of high-altitude operation will overbalance the loss of economy due to the weight of supercharging structure and equipment remains to be seen, but the interest of both designers and operators has now become keen enough to make sure that a great wealth of data will be assembled in the next two or three years.

Homogeneity of structure is a nine-syllabled phrase for defining the outcome of the designer's struggle to cut down structural weight by getting ever closer to that ideal condition wherein every fiber of material in the entire airplane will reach its ultimate strength at the same instant and the possibility of secondary or buckling failures will have been eliminated. No longer are simplifying assumptions that consign one type of load or of stress to one element of the structure, another to another good enough. The assembly has now to be analyzed as a unit, and this comparatively new insistence on making the skin carry a full share of the bending load as well as the horizontal shear and torsion has called for a greatly stiffened skin and for correspondingly lightened spar flanges or vertical trusses. It was long a subject of wonder that each nation, and in many cases each manufacturer, had a type of construction characteristic to itself, and that all methods and all materials seemed to give nearly enough equal efficiency so that their special sponsors felt justified in clinging to them. But now the whole world moves toward a structure so nearly uniform in type that the only serious dispute remaining concerns the degree of concentration of the spar

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Airplane Design

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web, the number of webs to be used, and the relative advantages of truss and plate-girder spars. In the fuselage, similarly, there is little difference of opinion except between those who would make all longitudinals of substantially identical cross-section and those who would still keep four or six extra heavy longerons as strong points in the structure.

Among the materials, current practice gives every indication that the light alloys are in the ascendency. Even in Great Britain, long faithful to fabricated strip steel, the corner seems to have been turned, and the latest and most efficient of British military aircraft make large use of aluminum-alloy tubular and monocoque structures. But 1936 saw also the production of the first all-stainless-steel shot-welded aircraft (Aviation, October, 1936) to be built in nearly five years, and steel's advocates stubbornly refuse to admit defeat. As a reminder that wooden construction could not be permanently dismissed to the pigeonhole marked ancient history, the Heinkel He 70 with wooden wing is still in active production in Germany, and when the Bristol Company prepared for its successful attack on the altitude record they used wood in their specially-built monoplane as giving the lightest possible structure in a machine of which the life need extend only over a single record-breaking flight.

GROUND HANDLING DEVELOPMENT brings in the closest approach to a real innovation that is now in the making. Proposed and tested by Fred Weick; energetically sponsored by John Geisse, the nose-wheel landing gear has made such progress that it seems likely to find widespread use not only for the amateur pilot but on the largest and heaviest airplanes as well. It promises not only to increase enormously the facility of handling on the ground in strong winds but also to make ground looping a forgotten maneuver and greatly to facilitate blind landing. Though few airplanes have actually been built in 1936 with the nose wheel, the year's most notable signpost certainly pointed toward their future construction.

Flying quality studies, and the increasing size of airplanes, have made designers take the exact balancing of control surfaces more seriously than ever before. Balancing uniformly, both aerodynamically and dynamically, throughout the span or height of the surface, in preference to using a horn at one extremity, has gained in prestige. The attempt is to fend off as long as possible the unwelcome day when increase of size will make manual control no longer possible, and so definitely require hydraulic or electric operation. For suitably light maneuvering, the transition to power control, or at least to a true Flettner type of servo tab, must apparently be made somewhere between 30,000 lb and 70,000 lb. gross weight. Just where is not yet apparent. The quests for lighter control and for longitudinal stability that will survive a tremendous range of movement of the center of gravity as the passengers wander about the cabin of a transport are jointly responsible for the strong swing to twin rudders. The wisdom of the swing is not yet quantitatively proven. It might yet turn out to be a fad based on observation of a couple of notably successful applications, but of the fact of the swing there is no doubt, and it has at least a fairly good chance of permanence. Experience to back that of American designers comes in from Germany where the Junkers 86 and the Heinkel 111, small fast bomber-transports, are much alike except in tail design. Unofficial report has it that the flying qualities of the twin-ruddered Junkers are extraordinarily good; those of the single-rudd dered Heinkel bad.

UNTIL SUCH TIME as the engine builders may bring out an engine of very much reduced overall dimensions for a given power there is little that can be left off of a present-day airplane. Judging the machine by its general aspect, the cleaning-up process has been carried almost to the limit, but there still remain in most cases some thousands of points of unnecessary disturbance, too small to be seen from more than a few yards away but not too small to affect the airstream. They are the rivet heads, and the lap joints in the skin, and the longest step toward further performance improvement that is now in the making is their elimination. How soon spot welding may make structural riveting obsolete, if at all cannot yet be foretold, but certainly 1936 saw greater strides in that direction than any previous year could record. If spot welding fails to sweep the field, flush riveting is coming. It is already common practice in Germany. Recent experience, and increasing intensity of competition for the last mile an hour, have made that plain. Flush riveting over the bottoms of flying-boat hulls and over the leading edges of wings is already common. It will extend farther and farther back on the chord, and along the sides of a hull or fuselage, until a button or brazier head projecting into the airstream will look as ridiculous as projecting arms on control surfaces and exposed wires would appear today.

The attempt to set forth all the details in respect to which progress has been made would require one full issue of AVIATION. After all that, there still remains plenty to be done. If a single item be selected to represent the year, let it be the increasing use of fuel tanks integral with the wings, the fuel resting directly against the skin and the weight of the tank as such being eliminated. Though that is still far from a standard practice, 1936 has moved it well along the road to becoming a cheerfully-accepted one.

We Go Abroad

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Nov. 10—Motored to Adlerhof to inspect laboratories of the DVL. Air Ministry luncheon at Haus der Flieger. Visited Air Ministry, including interview with General Milch.

Nov. 11—From Tempelhof to Rostock (Junkers Ju 86) to inspect Heinkel Works. Flight over Warnemünde, part of Baltic Sea, and return to Berlin after dark.

Nov. 12—From Tempelhof to Dessau (Ju-86) to inspect Junkers factory. Luncheon at Junkers. Return flight in Tempelhof to catch KLM Douglas for Amsterdam.

Nov. 13.—Inspected Fokker factory at Amsterdam. Amsterdam to Paris via KLM (Douglas DC-3). Attended opening of the XV Exposition Internationale de l'Aeronautique Grand Palais, Paris.

Nov. 14—At Aero Show.

Nov. 15 (Sunday)—Cook's touring in Paris.

Nov. 16—Aero Show. Luncheon by J. J. Ide for visiting Americans, Inter Allied Club.

Nov. 17—Aero Show. Visited offices of *L'Aeronautique*.

Nov. 18—Aero Show. Luncheon with staff of L'Aeronautique. Inspected engine and aircraft plants of Candron Renault.

Nov. 19—Aero Show. Inspected engine factory of Hispano-Suiza.

Nov. 20—Inspected Le Bourget Aerodrome, including Air France maintenance shops. Paris to London via Imperial (H. Heracles). Imperial Airways offices at Croydon.

Nov. 21—Offices of McGraw Hill. By train to Gatwick to inspect new aerodrome.

Nov. 22 (Sunday)—Seeing London, including South Kensington Museum and original Wright aeroplane.

Nov. 23—By rail to Bristol to see airplane and engine manufacturing of Bristol Company.

Nov. 24—Motored to Farnborough to visit Royal Aircraft establishment and laboratories. To Supermarine plant of Vickers at Southampton to inspect manufacturing facilities. Embarked on "Queen Mary."

Nov. 30—Arrived in New York.

Europe Rearms

(*Continued from page 30*)

to visit Italy during our recent visit abroad We have heard enough, however, from a number of people who have recently been in Aeronautical Italy, to be assured that Italy is not lagging behind the rest of Europe in developing her military aviation Actually, Italy is the only one of the major powers in Europe that has recently been on a full wartime footing and there is little doubt but that her air forces must be rated among the top flight of European air power Although she may not have as large an air force in numbers as Russia there is little doubt but that the quality of most of her equipment is first rate Her research facilities as exhibited in the huge aeronautical city of Guidonia certainly rank with the German D V L at Adlershof, the British works at Farnborough and at Teddington, and probably with our own NACA at Langley Field

Furthermore, Italy is known to have a large list of both active and reserve military pilots of first-rate ability ff, as we have guessed Germany's strength in machines exceeds her man power, and, if reports of Italy's large reservoir of trained pilots are accurate, the combined air forces of these two great powers should be powerful indeed.

FOR FIFTEEN YEARS after the close of the World War, France held a position of No 1 air power in the world. Whether or not she has counted too heavily on the cooperation of Russia's air fleet, or whether her development work has been hamstrung by internal economic and political difficulties she appears to have definitely slipped from her position of leadership Most significant of the trend of affairs in France is the present move toward the nationalization of the aircraft industry Briefly, the plan consists of the purchase of a controlling interest in the aircraft manufacturing companies by the state The country is to be divided into four manufacturing districts, geographically, each district being under the direct control of the Air Ministry So far the plan has resulted only in the organization of one district, the Department de l'Ouest,—and in a great deal of internal confusion As might be expected, serious differences of opinion have arisen as to what constitutes a fair price for the government to pay for its controlling interest. Actually the final decision rests in the hands of a board of arbitration which is, by the very nature of its membership, controlled by the government Ultimately, then, the plan consists essentially in condemnation proceedings by the government with purchase on its own terms Whether or not the plan can be carried through to a point where efficient production can be obtained before some European crisis develops is an open question Internal difficulties created by this move might easily create a very serious situation in the French procurement of aircraft in any sudden emergency of the near future

ALTHOUGH French manufacturers exhibited a number of new and up-to-date military designs at the Paris Salon, a few of them had so far been actually flown and fewer apparently were in active production It is dangerous of course to generalize too broadly on the basis of limited observation, but we received a distinct impression that French aircraft, both military and commercial, had not been advancing both as to quantity and as to quality, at as rapid a rate as those of the other European powers

England, characteristically perhaps, was slow to accept the challenge of an air armament race in Europe Well over a year ago, however, she recognized that her insular position in Europe had vanished and that her frontier was not the cliffs of Dover but was actually on the banks of the Rhine. The wheels of air force expansion which started moving slowly twelve months ago are now whirling at top speed and are just beginning to grind out real production. For months the day by day debate in the Commons and in the Lords has been concerned chiefly with aerial defense, with balloon barrages, with procurement of aircraft and engines, with the now famous 'Shadow Scheme" and with diplomatic questions of war and peace on the continent The turn of events of the past months has created a condition closely akin to panic in British aviation circles, and plane and engine factories everywhere are operating in high gear on practically unlimited orders to produce as many of the best types of aircraft as they are able to turn out up to the end of the year 1937 The pressure to produce military aircraft has had one result of interest to us British and other commercial air transport interests in Europe have been purchasing American-built airliners because their own builders are too preoccupied with military production to give more than passing attention to commercial types

The so-called "shadow" plan mentioned above deserves some discussion It is actually in use for both airplane and engine production in England at the present time. It consists primarily of taking an accepted design and farming out the parts manufacture to plants scattered over a wide area, then feeding all the finished parts into a central assembly plant. The plants selected to make the parts need not have had anything previously to do with the manufacture of airplanes or aircraft engines, although they would naturally be selected because their tooling or equipment lends itself readily to the manufacture of the parts Thus the aircraft industry would be responsible for the actual design of certain types but the burden of production would be shouldered by some of the other industries In normal times these so-called "shadow plants" would produce only enough parts to provide the necessary experience for their personnel, but in times of emergency, both the personnel and the equipment could be expanded to any desired level

CLEARLY the major weakness of the shadow scheme would be the total interruption of the auxiliary production in case one of the parts producers were bombed out of existence In order to eliminate this possibility it is necessary to develop a series of production chains with more than one company manufacturing the same part Thus, if one or more units were destroyed, the others producing the same parts could be expanded to make up for the loss. Considerable opposition arose, led by Lord Nuffield, manufacturer of Morris automobiles It was argued that more effective and quicker production could be obtained by farming out orders for complete airplanes and engines to concerns who were tooled up for other work but who might easily swing over into the aircraft field The present government felt, however, that the shadow plan offered the best "out," and Lord Nuffield retired from the scene of battle to

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Europe Rearms

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give his attention to the problem of producing motors for army tanks.

Taking the whole European situation together, it seems not unlikely that the five major powers, England, France, Germany, Italy, and Russia, could muster among them between 25,000 and 30,000 military aircraft today, and if present production rates are continued and no outbreak of active hostility occurs within the next twelve months, it is not unreasonable to estimate that the present number might easily be doubled by the fall of 1937. These figures would, of course, include a large number of aircraft that might be considered as obsolete or at least out of date. But distances in Europe are so small that even a relatively old type such as the German Junkers JU-52 is still an effective military aircraft. It can reach any military objective in Europe proper between dusk and dawn with a reasonably good military load, so that it and others like it cannot be eliminated from our count of military effectives. Evidently the Germans are of the same opinion for the Junkers plant at Dessau is still turning out huge JU-52s at the rate of two or three a day. One meets them in the air all over Germany, on both commercial and military missions. We saw at least 60 of them drawn up in rows outside of the hangars at Templehof one morning, and it is a fair guess that there are several thousands of them in storage all over Germany.

IN CONSIDERING these almost astronomical figures for European air fleets, it must be borne in mind that all of these aircraft would not be in active service at any one time. Many would, of necessity, be held in reserve and in overhaul depots undergoing repair and maintenance. It is conceivable, however, that the greater proportion of the military effectives of any one country might be available for the initial thrust that would undoubtedly characterize the outbreak of any future hostilities.

For, beyond all question, the great advantage in the next war goes to him who attacks first. Everyone realizes that in spite of talk of balloon barrages, intercepter fighters, and anti-aircraft batteries, there is no real defense against a determined mass attack with modern bombers against any objective within range, once that attack has been launched. Air power has made the old adage that the only defense lies in attack become more than a mere theory. The obvious move for any country determined to force its will by military measures against any other is an overnight surprise attack by masses of bombardment aircraft against enemy industrial centers. Primary objectives will be military airdromes, airplane and engine manufacturing centers, and production centers for the manufacture of basic raw materials. If the opposing aviation can be crippled on the first attack, the invasion of territory by ground troops may then proceed almost at leisure. There will be no particular object in the indiscriminate bombing of large centers of population unless some essential transportation center or a key industry can thereby be crippled. It has been general experience, and it seems to be psychologically sound, that accidental bombing of civilian population only irritates and tends to stiffen resistance rather than break down national morale. During a later phase of hostilities perhaps, after the first attack against basic industries has been successfully completed, would the bombing of cities be expected, more or less as a final resort to force surrender by applying pressure from the rear.

Which explains the reason for the type of construction employed in many modern aircraft and engine factories abroad. Instead of utilizing sites to their fullest extent by the usual method of putting buildings close together and in alignment a certain degree of overall efficiency is sacrified for an arrangement designed to minimize damage from falling bombs. A plant which normally might be put into a much smaller area is scattered over many acres. And literally scattered, for not only are they widely spaced, but no two adjacent units are allowed to line up in the same direction. An outstanding example of this type of layout is the Henschel plant on the outskirts of Berlin. Not only is the scatter arrangement adopted, but all windows in the plant and plant offices are fitted with screens so that work may go forward at night without any light showing outside. Furthermore, each unit has the needed bomb and gas-proof cellar into which all the workers may retire in case of a raid. It brings the threat of war very close to go down into these dugouts through the gas-tight doors and to see rows of chemically treated overalls, each with a gas mask hanging above it, each tagged with the number of the employee to whom it is assigned. The psychological effect upon the worker of such preparation is something to contemplate.

ONE OTHER new tactical concept coming over the European horizon deserves special mention. Heretofore the airplane has been considered solely as a striking weapon without ability to consolidate or hold ground once gained. Quite recently the reason behind Russia's abnormal interest in the training of parachute jumpers came out into the open. She has already, in maneuvers, demonstrated the principle that large masses of fighting men, complete with equipment, may be flown deep into enemy territory and put onto the ground by the parachute route. Late in the war of 1914-1918 occasional spies were put down behind the lines by airplanes, and before the end of the war the late General William Mitchell proposed something of the sort, but his scheme was rejected as too visionary by the General Staff. Latterly, Russia, France and Italy have experimented with the carrying of food and supplies in large airplanes, but these have been designed chiefly for colonial operations in out of the way quarters of the earth. The Russian concept is, however, a new one and something to be reckoned with by military tacticians all over the world. One need not be a military expert to evaluate the effect of the placing of several thousand picked troops with arms and full field equipment behind enemy lines at crucial points.

Readers will recall that not long since we expressed satisfaction editorially on the present insular position of the United States with respect to Europe. After completing our tour abroad we have but confirmed our initial impression. The disparity between our own aircraft production and production in Europe at the present time is considerably offset by the ocean barriers that surround us. But if the rest of the world continues to build up its air forces at present rates, it is not impossible that we will be forced to think also of aircraft production in terms of thousands where now we think in hundreds.

Design for Production

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ment flying. Mr. Beard called for more accurate air speed meter calibration and for a location of the pitot tube that would make its static side furnish a true pressure base for the sensitive altimeter. He had found altimeter readings out as much as 40 ft., in some cases with standard pitot tube connections, and it had been possible to reduce that error to 5 ft. by changing the location of the pitot. This was obviously a subject of lively interest as Mr. Schildhauer, Dr. Oswald of Douglas and Mr. Johnson of Lockheed all hastened to discuss it. They all found calibration a great problem, the cost of a standard calibration on an Electra running to $250. That figure has been much reduced, and the whole job enormously simplified, by giving up the speed course in favor of a trailing bomb carrying a pitot for calibration purposes.

THE USE OF X-RAYS and gamma rays for industrial inspection was treated by Tom A. Triplett. Though he dwelt at length on the common application of X-rays for detecting hidden flaws in castings or forgings, he hoped also that the other uses of the radiation would not be overlooked by the industry. X-rays were a serviceable tool of chemical analysis, making use of the spectroscope; and they made it possible to determine the molecular structure of the material and to draw deductions regarding its properties and the way in which they might be improved.

Taking the detection of defects extending through 2 per cent of the thickness of the member as defining the desirable accuracy of inspection, Mr. Triplett found that accuracy obtainable in sections of steel up to 3 in. in thickness and in aluminum up to 7 in. By using gamma rays instead of X-rays, even greater thickness could be handled. It developed in discussion that several of the large airplane manufacturers are now using X-rays for routine inspection with good results, and hope for a considerable increase in the use of cast fittings either of steel or of light alloy as a result. With the X-ray to determine blow holes, shrinkage cracks, and inclusions of slag or other foreign matter, they believed that casting could be made as dependable as any other process. A representative of Lockheed was particularly enthusiastic over his company's experience.

THERE REMAINS the engine session. A. L. Beall of the Wright Co., speaking on "Selection of Oils for High Output Aircraft Engines," was somewhat disdainful of the value of chemical specifications. They were useful as far as they went, and at least they were harmless, but "the most striking thing about a specification for a lubricating oil is that there is nothing in it to tell how well the oil will lubricate." To supply that deficiency, he thought it necessary to make actual running tests on an engine in every case. To prove his point he showed many charts where particular characteristics, such as flash point and carbon residue of the oil, were plotted against the merit as determined in service. They were all of completely shot-gun character, with both good oils and bad to be found at both high values and low of any characteristic.

C. M. Larson of the Sinclair Co. approved full-scale testing in principle, and thought it to be coming progressively more necessary through the increasing use of compounded oils, for which specifications had even less meaning than for the simpler lubricants of the past. Other contributors to the discussion were less enthusiastic about a complete dependence on full scale testing. Ashley Hewitt urged the development and inclusion in specifications of specific mechanical tests for coefficient of friction and rate of wear of standardized members in a standardized testing gear operated with the test lubricant. A representative of Richfield didn't see what all the shooting was about anyway, as he thought the aircraft engine problem not a particularly difficult one. The high-speed diesel he considered much more troublesome. He thought Mr. Beall wanted to throw out the accumulated experience of the petroleum industry whereas he himself believed that chemical and physical specifications had been an excellent guide and still would be. Mr. Beall in reply denied wanting to throw out past experience, except so far as present experience was indicating it to be useless, and he emphatically denied that the diesel was a more difficult lubricating problem than the aircraft engine in view of the much higher mean effective pressure of the latter. Edward P. Warner suggested an analogy with the history of fuel testing and of the great difficulty that had been experienced in getting anti-knock measurements accepted and the octane number rated as a standard characteristic of fuels. Like Mr. Hewitt, he thought that chemists had had the field too much to themselves, and that what specifications needed was not to be discarded but broadened by including mechanical testing along with analysis. He viewed with great alarm the introduction of a Wright Aeronautical Corp. test method for lubricants, while at the same time admiring the pioneer work that the method involves, for he feared that it would soon be followed by a Pratt & Whitney method, a Menasco method, and half a dozen others, and he suggested a prompt drive through the S.A.E. and the A.S.T.M. to get the methods of service testing and specifying lubricants standardized. Mr. Beall concurred on the desirability of that, and offered the Wright method merely as paving the way for the standardization for which he hoped.

JOHN M. TYLER of Lycoming talked on engine insulation vibration problems. Mr. Tyler showed how, with as little damping as is sometimes present in an aircraft installation, the vibratory load in resonance with the natural period of the structure may produce deflections and stresses up to twenty-five times what the load would produce if statically applied; and how a change of but 20 per cent in natural frequency will reduce that ratio of amplification by three-quarters or more. Since resonance cannot always be avoided in all members, there must be damping, and the engine mount has the two functions of insulating the engine from the rest of the structure and of changing natural frequencies so that resonance will not occur under normal operating conditions. If the softening of the mount is carried too far, Mr. Tyler explained, the natural frequency is lowered to the idling range and the engine bounces about badly while idling. Users of air transport planes of a few years ago will recall one celebrated case.

Classified Advertising

10 CENTS A WORD — $2.00 MINIMUM

Planes, Engines & Parts For Sale

Indexed—See page 79

SIKORSKY S-39 amphibian 5 place cabin, 300 hp Wasp Jr Can be inspected at any time at Post Washington Seaplane Base, Port Washington, L I N Y F S 357 Aviation 330 West 42nd Street, New York City No 1

J 5 NOSE SPINNER including magneto covers, $20 00 exhaust ring, $5 00, spred ring $40 00 Kinner exhaust manifold, $35 00 Engel Aircraft Specialties, Escondido, Calif forma No 2

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1936 STINSON six months old, five-place leather upholstering, Hamilton controllable, 100 hours lights, flares bonded, airfield cost $4400 00 now $6500 00 Waco F, 125 Kinnett, just recovered, new condition throughout, $1450 00 J5 Travelair, good $1100 00 J5 Waco like new special paint new engine starter and other extras $1600 00 Taylor Cub six months old, looks new, finished yellow black stripe, $875 00 Blue and yellow Cub same as new, 55 hours total time, privately owned $925 00 OX Waco $325 00 Arrowcraft two-place licensed, heater, enclosure, $600 00 Meinke-Bilteed Flying Service Lost Nation Airport Willoughby, O No 4

VELIE MONOCOUPE Factory modernized motor Perfect covering Recently overhauled Licensed to Sept 1937 Priced for quick sale S W Raymond 1622 N McVicker Ave, Chicago, Ill No 6

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STINSON RELIANTS J5 Travelair J6S Waco Warner Waco J6S Travelair cabin Cost Waco E 2 OX5 Waco OX5 Robin Several other types List free Jacks Aero Brokerage South Omaha, Neb No 14

FAIRCHILD 42—330 H P Wright 4-place cabin long range $7,000 Cyclone Propeller $100 Excellent condition Erik G Frobeg 2223 Fourth Ave N Seattle, Wash No 15

FAIRCHILD 24 Inverted Cirrus 95 H P like brand new Mfg August 1933 Licensed to November 1937 Price $1550 can finance part F S 362 Aviation, 330 West 42nd Street, New York City No 16

125 WARNER FLEET Ship and engine positively A C Particulars on request $1575 G J Boody, 157 Owasco St, Auburn, N Y No 17

WACO CABIN 1934, like new, Jacobs 225 modernized, full set instruments, Radio, Piano, Flares Bend Prop, $3600 00 Also 3-4 Place 125 Kinnett, Haywood 40-hrs since majored Full set instruments Semi airwheels, $1500 00 Red Bank Airport Red Bank, N J, Phone 1730 No 18

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HUNDREDS OF AIRPLANES Motors, trade-ups, Specialpiares $55 up, OX 5 jobs $100 up Big Winter Directory just out 25c pos paid Used Aircraft Directory, Athens, Ohio No 28

GOVT overhauled, 90 hp OX 5 $127 50 New 110 hp Anzani $99 00, Overhauled 55 hp Velie M 5 $168 00, Used 35 hp Siemens Halske $148 50; Overhauled 35 hp Anzani $195 00 Used 135 hp Cuminz $95 00 Karl Ort, 582 Poplar, York, Pa No 29

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1935 SR 6 privately owned Stinson Reliant—NC14122 $5,895, cost nearly $9,000 with extras, including standard instruments plus Kollsman sensitive altimeter; Smith controllable propeller, 100 gallon tanks, flares, landing lights, R C A Radio, turn and bank, red and cream finish with matching red leather upholstery; purchased new from Stinson September 1935, never cracked, flown by one pilot only, maintained without regard for cost, used for personal travel only M Reynolds 542 South Dearborn St, Chicago Ill No 31

ENGINES AND PARTS for sale Liberty 400 hp, Hispano E 180 hp, also quantities of Pratt & Whitney, Wright Curtiss and Packard engines The Vimalter Company, Ltd, 841 Garfield Ave, Jersey City, N J No. 32

Additional Classified Advertisements on pages 79 and 80

CLASSIFIED ADVERTISING

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JANUARY, 1937 ISSUE

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